

# Chapter 3

## Alternatives



## Chapter 3 Alternatives

This chapter describes reasonable alternatives for the Project, including the ‘no action’ alternative, as required by NEPA, and three ‘build’ alternatives that involve the reconstruction of Virginia Avenue Tunnel at its current location. It also describes various concepts presented at public meetings that were eliminated from detailed study and discusses the reasons for their elimination. These four candidate alternatives were selected through a rigorous evaluation in this Draft EIS following a detailed screening process that identified and evaluated 12 different concepts for the Project.

This chapter is organized as follows:

- Description of the “No Action” or “No Build” alternative, Alternative 1;
- Explanation of the process that led to the selection of the three Build Alternatives, which includes:
  - Description of the various concepts considered as candidate Build Alternatives for this Draft EIS,
  - Description of the screening process (involving eight criteria) that was applied to the ‘build’ concepts, which resulted in the selection of three concepts that were developed into Alternatives 2, 3 and 4 for this Draft EIS; and
- Detailed descriptions of Alternatives 2, 3 and 4.

In the initial phases of project development, 12 concepts were developed and analyzed to determine whether they meet eight criteria based on the Project’s Purpose and Need (see Section 3.2.2). After applying these criteria, four of those 12 concepts were retained in the Draft EIS for detailed analysis as formal NEPA alternatives, including a “no build” scenario. The three Build Alternatives underwent additional engineering design modifications largely to ensure that the demolition of exiting tunnel structures and the construction of new facilities minimize risks to the structural integrity of I-695, which is aligned immediately to the north of the tunnel. In addition and regardless of Build Alternative, the Project would extend the east portal by approximately 330 feet to a location northeast of the 12<sup>th</sup> Street and M Street T-intersection.

West Tunnel Portal at 2<sup>nd</sup> Street SE



East Tunnel Portal at 11<sup>th</sup> Street SE



The four alternatives retained for detailed analysis in this Draft EIS are as follows:

- Alternative 1 - No Build (originally Concept 1): The No Build alternative is automatically carried forward into the Draft EIS. The tunnel would not be rebuilt under this alternative. However, the railroad would continue to operate trains through the tunnel and at some point, emergency or unplanned major repairs or rehabilitation could be required to this critical, aging infrastructure that might prove equally disruptive to the community than the Build Alternatives.
- Alternative 2 - Rebuilt Tunnel / Temporary Runaround Track (originally *Concept 2*): This alternative involves rebuilding the existing Virginia Avenue Tunnel. It would be rebuilt with two railroad tracks and enough vertical clearance to accommodate double-stack intermodal container freight trains. It would be rebuilt in generally the same location, except aligned approximately seven feet to the south of the existing tunnel center line. It would be rebuilt using protected open trench construction methods. During construction, freight trains would be temporarily routed through a protected open trench outside the existing tunnel (runaround track). The runaround track would be aligned to the south and generally parallel to the existing tunnel, and would be located below street level. Due to new columns associated with the rebuilt 11<sup>th</sup> Street Bridge, the runaround track would slightly separate from the tunnel alignment on the east end starting just west of Virginia Avenue Park. Safety measures such as securing fencing would be used to prevent pedestrians and cyclists from accessing the runaround track.
- Alternative 3 - Two New Tunnels (originally *Concept 5*): This alternative involves replacing the existing Virginia Avenue Tunnel with two new permanent tunnels constructed sequentially. Each new tunnel would have a single railroad track with enough vertical clearance to allow double-stack intermodal container freight trains. A new parallel, south side tunnel would be built first as trains continue operating in the existing Virginia Avenue Tunnel. After the south side tunnel is completed, train operations would switch over to the new tunnel and the existing Virginia Avenue Tunnel would be demolished and rebuilt. With the exception of operating in a protected open trench for approximately 230 feet immediately east of the 2<sup>nd</sup> Street portal (within the Virginia Avenue SE segment between 2<sup>nd</sup> and 3<sup>rd</sup> Streets SE), trains would operate in enclosed tunnels throughout construction under Alternative 3. Throughout most of the length of the rebuilt tunnel, the two tunnels would be separated by a center wall. This center wall would be the new centerline of the two tunnels, and it would be aligned approximately 25 feet south of the existing tunnel centerline, between 2<sup>nd</sup> and 9<sup>th</sup> Streets SE. Due to new columns associated with the rebuilt 11<sup>th</sup> Street Bridge, the tunnels would be separated on the east end starting just west of Virginia Avenue Park, resulting in two separate single-track tunnels and openings at the east portal.
- Alternative 4 - New Partitioned Tunnel / Online Rebuild (originally *Concept 6*): Alternative 4 would result in a new tunnel with two permanent tracks. Similar to Alternative 3, the new tunnel would be partitioned and have enough vertical clearance to allow double-stack intermodal container freight trains. It would be aligned approximately 17 feet south of the existing tunnel's centerline. The new tunnel would be built using protected open trench construction methods. The rebuild would occur 'online' meaning that during the period of construction, the protected open trench

would accommodate both construction activities and train operations. Maintaining safe and reliable temporary train operations is a more complicated endeavor under Alternative 4 than under the other two Build Alternatives due to the online rebuild approach.

Additional information about Alternative 1 is in Section 3.1. Additional information about Alternatives 2 through 4 is in Section 3.3.

The Final EIS will identify the preferred alternative after consideration of public comments.

### 3.1 Alternative 1 - No Build

Full consideration is given in this Draft EIS to the environmental consequences of taking no action to meet Project's Purposes and Need described in Chapter 2. For the purposes of analyzing the impacts of the Project, Alternative 1, or the No Build alternative, provides a baseline condition with which to compare the consequences associated with the proposed action.

Under Alternative 1, the existing single-track tunnel would remain the same, and still in use. It would continue to be part of the mainline eastern seaboard freight rail corridor for commercial freight traffic for the Washington Metropolitan Area and other markets, such as those throughout the Mid-Atlantic and Midwest states. However, the existing Virginia Avenue Tunnel cannot accommodate double-stack intermodal container rail cars -- rail cars that vertically stack two intermodal containers and thus carry twice the load as an ordinary single-stack rail car. Intermodal containers are metal containers that move from ship, to truck, to rail, without any adjustments needed. Under Alternative 1, modern freight rail operations, which use double-stack intermodal container freight trains, would not be possible along the increasingly busy eastern seaboard freight rail corridor. Virginia Avenue Tunnel would also remain a bottleneck to the network with its single-track configuration, and along with the inability to accommodate double-stack intermodal container trains, makes this single, relatively small segment of the I-95 corridor a limiting factor in preventing substantial improvements to the freight carrying capacity of the entire network in the Mid-Atlantic.

Alternative 1 does not include any major repairs or rehabilitation of the tunnel in the near future. However, given its 100-year plus age, the tunnel could require emergency or unplanned repairs at some point in the future to maintain commercial freight movements and protect the safety of railroad personnel and the public. Such a repair may require closure of at least part of Virginia Avenue SE in order for CSX to make the necessary repairs similar to what occurred in 1985 when a 150-foot section of the tunnel roof collapsed and had to be repaired under emergency conditions. In addition, the tunnel would eventually require rehabilitation or replacement, which may occur under an unplanned condition, and possibly at a time when the surrounding neighborhood is more fully developed with increased traffic as a result. Unplanned repair or rehabilitation would not only inconvenience the surrounding community, but has the

potential to severely affect commercial freight rail operations with wide implications to regional and/or national freight movements.

### 3.2 Alternatives Selection Process

NEPA requires federal agencies to “rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated (40 CFR §1502.14(a))”. According to the Council on Environmental Quality (CEQ) guidance, reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant (CEQ, NEPA’s Forty Most Asked Questions). At the same time, when considering a proposal from a private applicant for federal approval, NEPA’s “rule of reason” directs federal agencies to look at the general goals of a project in developing an appropriate range of alternatives. Therefore, unlike a proposed public infrastructure project, such as a new public road or bridge, that needs to compete with other projects for public funds, this Project represents CSX’s judgment of the action it needs to take to satisfy its common carrier obligation as one of the nation’s leading freight rail companies.

This section introduces the 12 preliminary concepts that were considered as candidates for the Project, and describes how the concepts were evaluated to determine which would be developed into alternatives carried forward for a more detailed analysis through the Draft EIS. The evaluation was based on the following eight criteria, which are based on the Purpose and Need for the Project and economic and feasibility factors:

- Criterion 1: The concept, upon completion, will address the deficiencies of the Virginia Avenue Tunnel.
- Criterion 2: The concept, upon completion, will provide the necessary improvements for operating double-stack intermodal containers and have two railroad tracks for the efficient flow of commercial rail freight through the Washington Metropolitan Area.
- Criterion 3: The concept will avoid major impacts to the structures, traffic or access to or from I-695.
- Criterion 4: The concept must allow for the maintenance of traffic across Virginia Avenue and along adjacent streets throughout the duration of construction.
- Criterion 5: The concept will maintain interstate rail commerce without a substantial negative impact to the level of service during construction.
- Criterion 6: The concept will be implemented in a time frame that accommodates the near term anticipated increase in freight traffic.
- Criterion 7: The concept has a comparatively reasonable duration of construction in the vicinity of the existing tunnel.
- Criterion 8: The concept has a comparatively low cost.

#### 3.2.1 Alternative Concepts Overview

In order to develop reasonable alternatives to address the Project’s Purpose and Need, a preliminary assessment of the engineering and physical constraints was conducted along the

alignment of the existing tunnel. In addition, DDOT and FHWA sought input from Federal and District agencies, interested parties and the general public. From these activities, the following 12 preliminary concepts were developed.

- Concept 1 is the no action or no build condition. It automatically is carried through this Draft EIS and was developed as Alternative 1 described in Section 3.1.
- Concepts 2 through 7 involve the rebuilding or reconfiguration of the Virginia Avenue Tunnel. Among these concepts is Concept 3A, which was developed in response to public comment during analysis of the 11 original preliminary concepts, and increased the total number of concepts considered for the Project to 12.
- Concepts 8 through 11 involve rerouting the main rail line outside of the existing Virginia Avenue SE, but the tunnel would remain to service Washington Metropolitan Area regional customers.

The remainder of this section includes descriptions of each of the concepts that were then evaluated, and resulted in the selection of the four NEPA alternatives retained for further detailed consideration.

After the 12 concepts were screened to produce four candidate alternatives, the additional engineering efforts to further develop the candidate alternatives, as described in this chapter, are not of final design level precision with respect to the description of facility locations (e.g., tunnel alignments and portal locations) within the public space (including subsurface) at or near Virginia Avenue. These final design details would be developed after the NEPA process is concluded, and if a Build Alternative for the Project is approved. For this document, each alternative is described with the precision necessary to identify and address reasonably foreseeable environmental and social impacts. Because all three Build Alternatives described in this Draft EIS contemplate that the reconstructed tunnel would only be located within CSX-owned or public property, rather than intruding into or under any private property, no additional detail beyond those already presented here is warranted. As the concepts and Build Alternatives were being developed through a series of public meetings and consultation with agencies, additional engineering was conducted for each of the selected Build Alternatives and minor changes continue to be made to their specific descriptions (e.g., construction phasing and tunnel alignments).

#### Concepts 2 through 7: Rebuild Virginia Avenue Tunnel

Concepts 2 through 7 involve the rebuilding of the existing Virginia Avenue Tunnel generally within the existing tunnel envelope but with sufficient vertical clearance to allow for double-stacking of intermodal containers. Following construction, freight traffic would operate more efficiently by the use of double-stack intermodal container cars because at least 21 feet of vertical clearance would be provided within the rebuilt tunnel. In addition, all of these rebuild concepts would provide two sets of permanent tracks within the tunnel corridor to improve the fluidity and operations of the railroad. Trains moving in opposite directions would be able to traverse the rebuilt tunnel simultaneously. Under Concepts 2, 3, 4, 6 and 7, the rebuilt Virginia Avenue Tunnel would largely be the same design, two sets of track within a single tunnel.

Concepts 3A and 5, on the other hand, involve the construction of two tunnels, each containing a single set of tracks, and both having the necessary vertical clearance to accommodate double-stack intermodal container freight trains. (Note that Concept 6, which became Alternative 4, was changed to include a partitioned tunnel.)

The rebuild concepts differ in how each would maintain freight operations during construction. Concepts 2, 3 and 4 would provide a temporary detour or “runaround” track in a protected trench. A range of design options are available to maintain a protected trench, such as various forms of safety barriers to isolate the trench from access by passersby and trespassers. These include stockade and chain link fencing, and Jersey barriers. Additional detail about trench safety and security is provided in Section 3.3.1.5. Concepts 3A and 5 would not require temporary facilities to maintain freight rail operations. The new single railroad track tunnel would be built outside of the existing tunnel alignment and would accommodate train traffic while the second tunnel would be built within the existing tunnel alignment. Concept 6 would maintain freight operations within the existing envelope of the Virginia Avenue Tunnel. Concept 7 would temporarily reroute freight trains outside the District during construction.

Among the rebuild concepts all have approximately the same layout (i.e., they would cover approximately the same surface area during and after construction). On the west end, the temporary runaround or permanent track would connect with the existing track near the New Jersey Avenue overpass. At the east end, the temporary runaround or permanent track would connect with the existing track in the vicinity of 14<sup>th</sup> Street SE.

Upon completion of the rebuilt Virginia Avenue Tunnel, the surface of Virginia Avenue SE and other disturbed areas would be restored under all rebuild concepts.

During and following construction, Washington Metropolitan Area regional customers would continue to receive freight transportation service through the Virginia Avenue Tunnel under the rebuild concepts. However, Concept 7 would not be able to maintain the same level of freight service for Washington Metropolitan Area regional customers during construction because train operations through the Virginia Avenue corridor would not be available under this concept.

All temporary measures to maintain freight rail operations within the Virginia Avenue SE corridor during construction (Concepts 2 through 6) would allow for the operation of double-stack intermodal container freight trains.

Brief descriptions of Concepts 2 through 7 are provided in Sections 2.2.1.1 to 2.2.1.7.

#### Concepts 8 through 11: Reroute Concepts

The “reroute” concepts (Concepts 8 through 11) would all involve rerouting mainline freight rail traffic out of the Virginia Avenue Tunnel at its present depth and location in lieu of near-term reconstruction of the tunnel (Concepts 2 through 7). Under Concepts 8 through 11, new mainline freight rail routes would be constructed within or outside of the District of Columbia.



Concepts 8 through 11 would result in projects of considerable magnitude because they would require either digging an approximately nine-mile deep tunnel (Concept 8) or establishing new mainline freight rail lines that would entirely bypass the District of Columbia (Concepts 9, 10 and 11). Concepts 8 through 10 would require a new Potomac River crossing (tunnel or bridge) because the Long Bridge (see Section 1.2) is the only freight rail bridge crossing the Potomac River, between Harpers Ferry, WV and the Chesapeake Bay.

Upon completion of any of the reroute concepts, freight rail trains would continue to use the Virginia Avenue Tunnel to service customers in the Washington, DC area. Because the existing Virginia Avenue Tunnel must remain operational, Concepts 8 through 11 may involve emergency or unplanned repairs of the tunnel at some point in the future, which might require closure of at least part of Virginia Avenue SE in order to make the repairs. In other words, the tunnel's structural deficiency described in Section 2.1.3 would remain, and the Virginia Avenue Tunnel would eventually require major rehabilitation or replacement, possibly at a time when the surrounding neighborhood is more fully developed and with increased traffic as a result.

Descriptions of Concept 8 through 11 are provided in Sections 3.2.1.8 to 3.2.1.11.

### 3.2.1.1 Concept 2: Rebuild, Temporary South Side Runaround

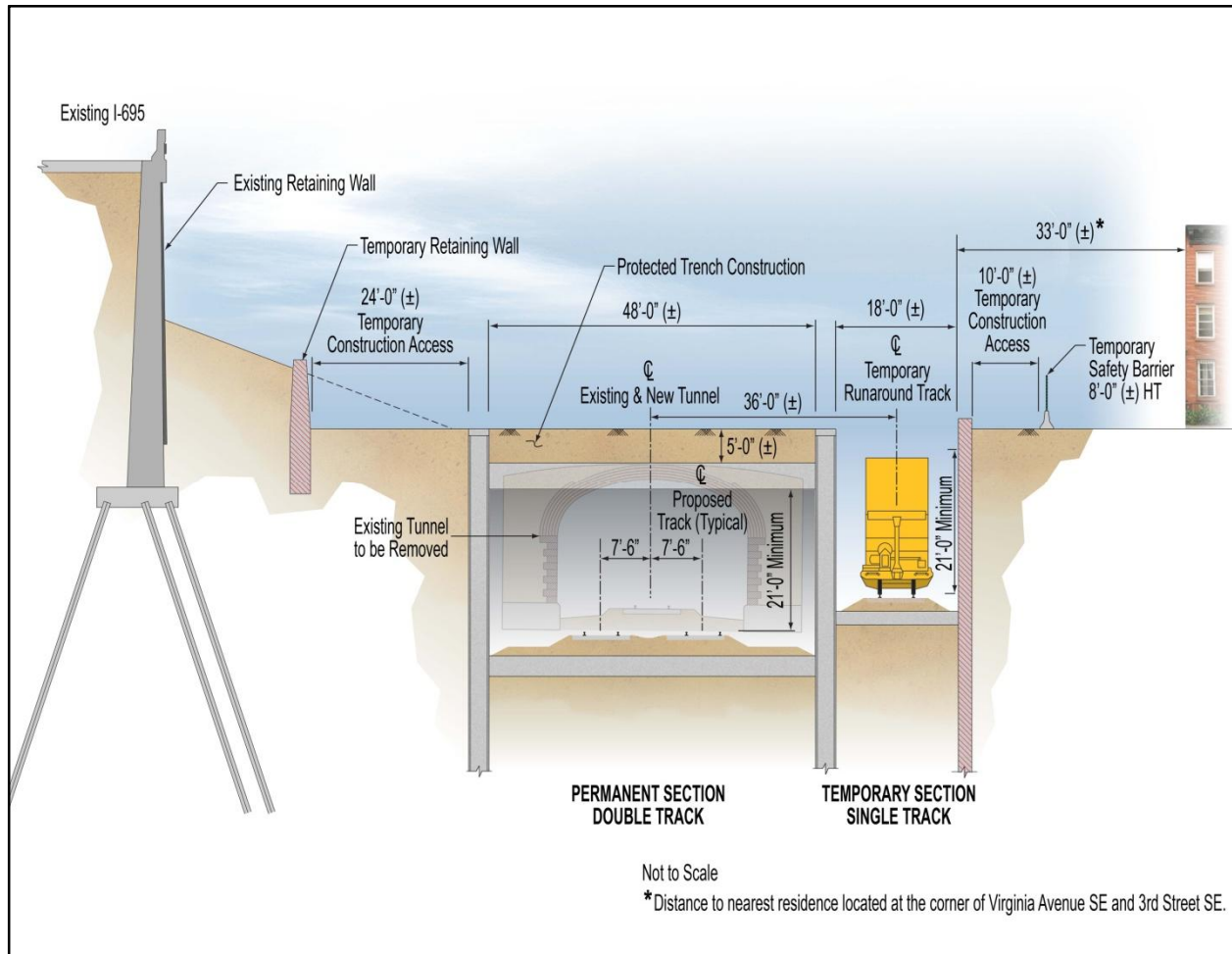
The Project under Concept 2 would reconstruct the existing single-track Virginia Avenue Tunnel into a new double track/double stack tunnel within the approximate existing horizontal envelope or alignment of Virginia Avenue Tunnel (see Figure 3-1). To maintain freight traffic during construction of the new tunnel, Concept 2 would provide a temporary runaround track placed inside a protected trench constructed immediately south of the existing tunnel alignment, also shown in shown in Figure 3-1.

Placing the temporary runaround track/trench for Concept 2 on the south side of the existing tunnel would avoid the long-term closure of the Interstate 695 (I-695) off- and on-ramps located at 6<sup>th</sup> and 8<sup>th</sup> Streets SE (I-695 ramps), respectively, during construction (see photograph of I-695 Off-Ramp). Intermittent short-term closures of the I-695 ramps may be required for maintenance of traffic shifts. Upon completion of the rebuilt Virginia Avenue Tunnel, the runaround track would be removed and the protected trench would be backfilled.

I-695 Off-Ramp at 6<sup>th</sup> Street SE



Figure 3-1  
Concept 2 Typical Section



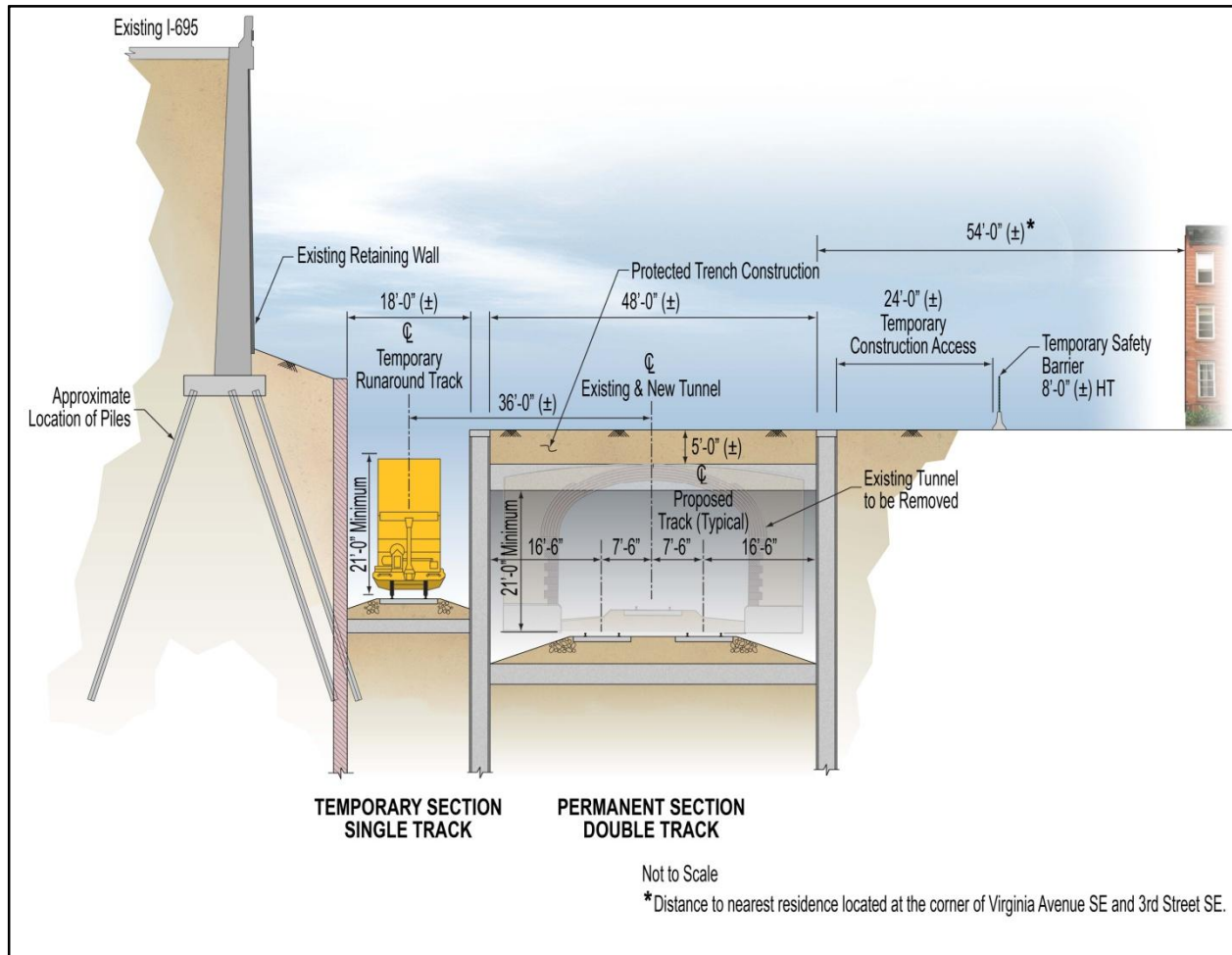
### 3.2.1.2 Concept 3: Rebuild, Temporary North Side Runaround

Concept 3 is similar to Concept 2, except that instead of placing the temporary runaround track in a protected trench on the south side of the existing tunnel alignment, it would be placed in a protected trench immediately north of the existing tunnel alignment, or located between the existing tunnel and I-695 (see Figure 3-2).

Aligning the temporary runaround track on the north side of the existing tunnel would place temporary freight operations as far as feasibly possible from land uses on the south side of Virginia Avenue, but still within the confines of the public right-of-way. Due to the temporary runaround track's proximity to I-695, long-term (throughout most of the construction duration) closures of the I-695 ramps would be required. It may be possible to stagger these closures so only one of the ramps is closed at a time, but long-term closure and disruptions would still be required. Similar to Concept 2, the runaround track would be removed and the protected

trench would be backfilled upon completion of the rebuilt Virginia Avenue Tunnel. The I-695 ramps would also be reopened.

Figure 3-2  
Concept 3 Typical Section

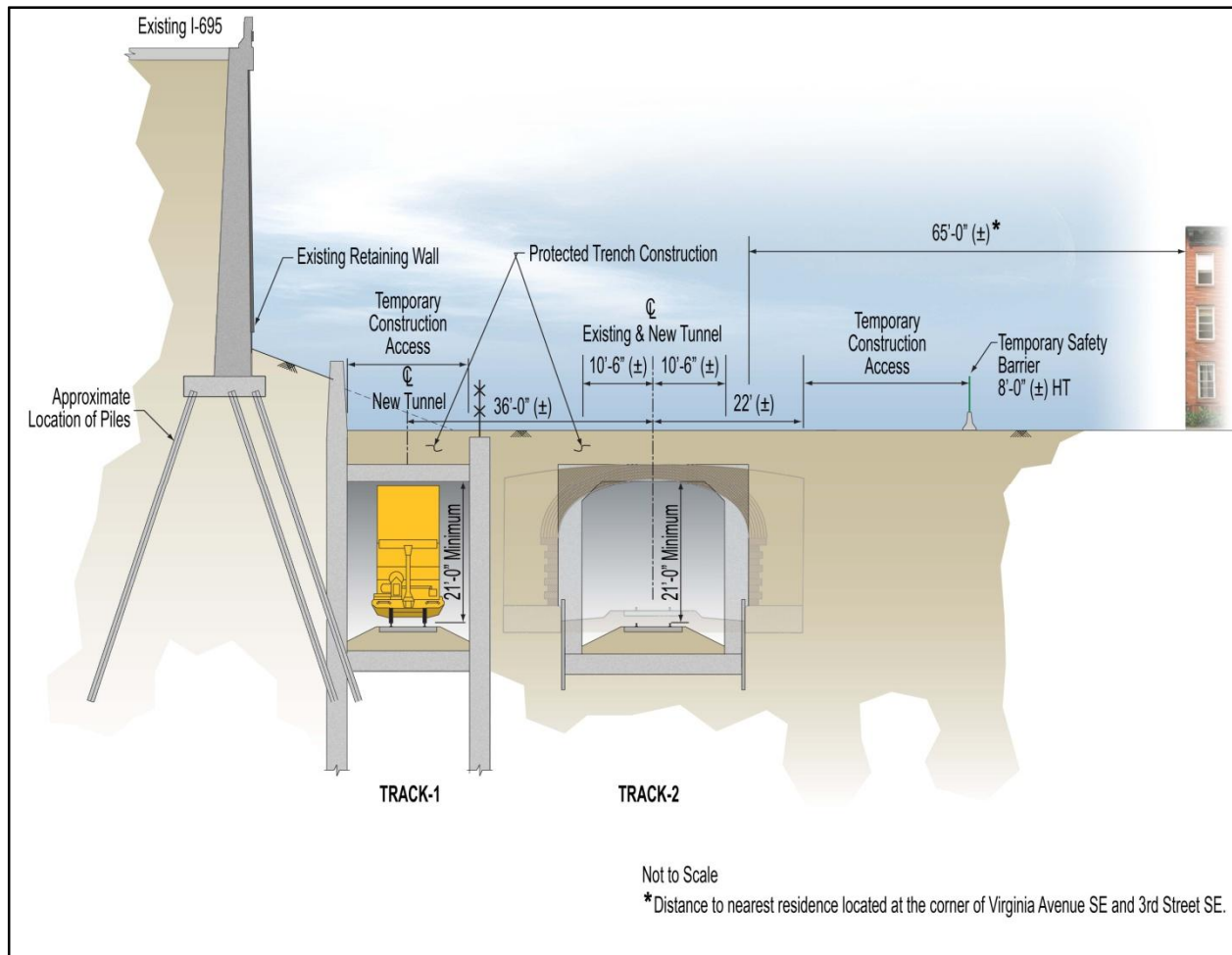


### 3.2.1.3 Concept 3A: Rebuild, Permanent Two Tunnels (New Tunnel on North Side of Existing Virginia Avenue Tunnel)

Concept 3A was developed during discussions with the public during community meetings where the original 11 project concepts were presented. This concept combines the elements of Concepts 3 and 5. Like Concept 5, Concept 3A would result in the construction of two single-track/double-stack tunnels (see Figure 3-3). The new, second single-track/double-stack tunnel would be set along the same alignment as the temporary northern runaround track/trench as presented under Concept 3.

Similar to Concept 5, this second tunnel would be constructed first. On the west end, the new permanent track would connect with the existing track near the New Jersey Avenue overpass. Both permanent tunnels would be constructed using a cut-and-cover method. Due to the proximity of the new tunnel to I-695, long-term (throughout most of the construction duration) closures of the I-695-ramps would be required. It may be possible to stagger these closures so only one of the ramps is closed at a time, but long-term closure and disruptions would still be required. Once completed, the new permanent single-track/double-stack tunnel would serve as a route for two-way train traffic while the existing tunnel is reconstructed and converted into a new single-track/double-stack tunnel. Upon completion of the second single-track/double-stack Virginia Avenue Tunnel, train traffic would be split with one-way traffic in each tunnel.

Figure 3-3  
Concept 3A Typical Section

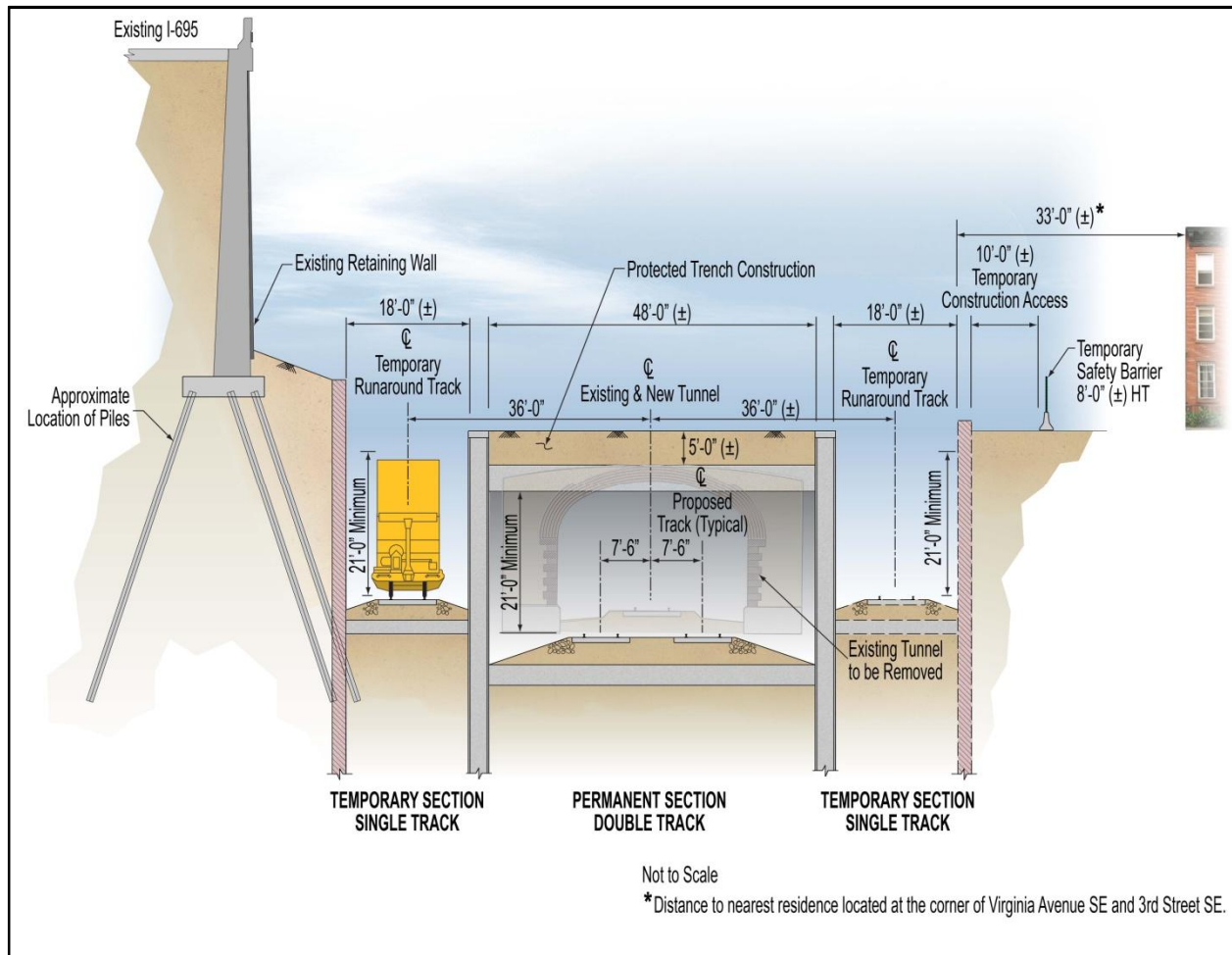




### 3.2.1.4 Concept 4: Rebuild, Temporary Combination Runaround

Concept 4 is also similar to the Concepts 2 and 3 in that the rebuilt Virginia Avenue Tunnel would be reconstructed generally within the existing horizontal envelope of the existing tunnel. Instead of placing the temporary runaround track/protected trench on the north or south side of the existing tunnel, it would have a serpentine alignment, crossing the existing tunnel at two locations (see Figure 3-4).

Figure 3-4  
Concept 4 Typical Section



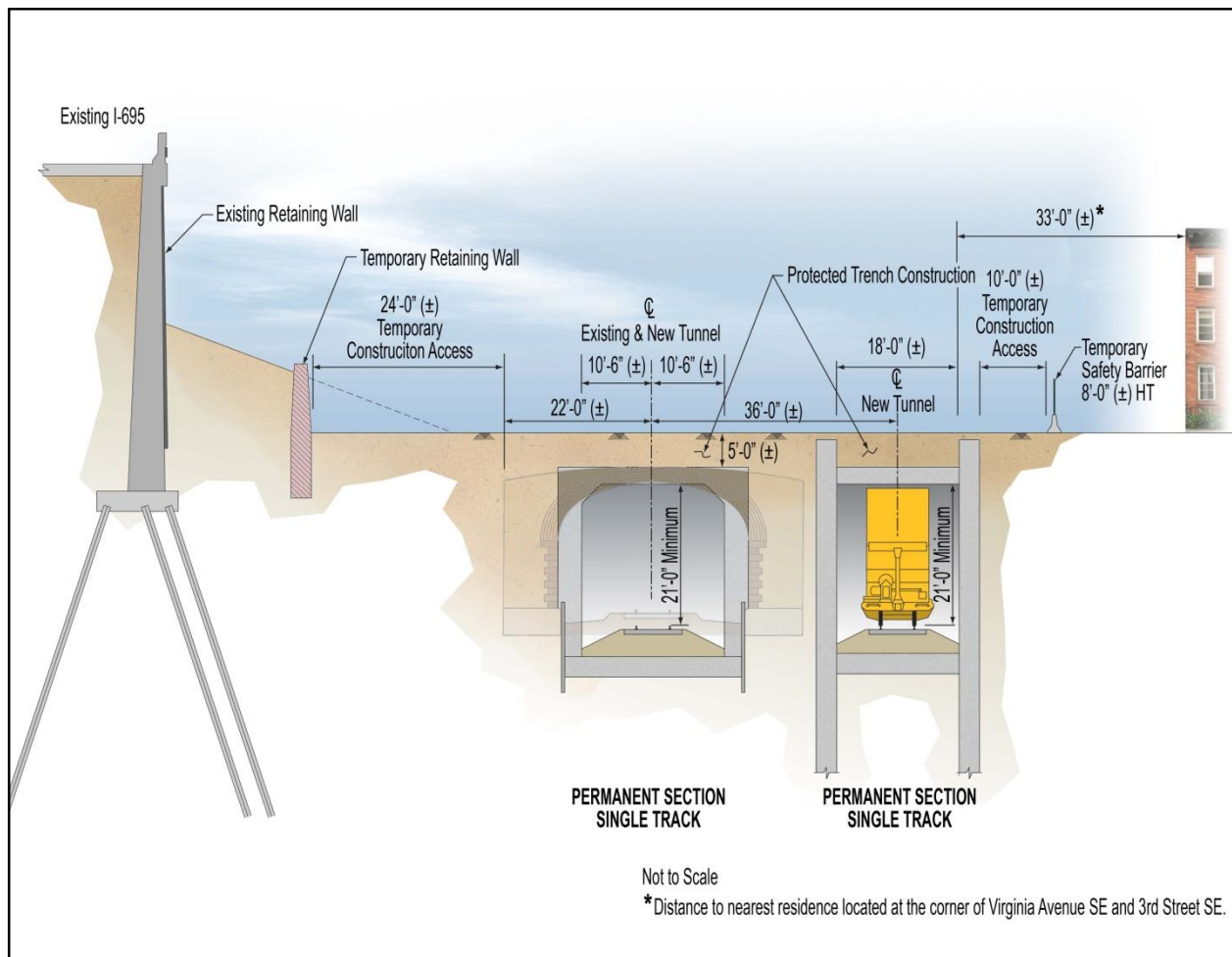
The rationale behind the configuration of the serpentine temporary runaround track under Concept 4 was to explore the possibility of placing temporary freight operations as far as feasibly possible from land uses on the south side of Virginia Avenue, but still within the confines of the public right-of-way, while avoiding the long-term closure of the I-695 ramps on the north side. On the west end, the runaround track would be the same as Concept 2, and

continue on the south side of the existing tunnel between 2<sup>nd</sup> and 5<sup>th</sup> Streets SE within a protected trench. At 5<sup>th</sup> Street SE, the temporary runaround track/trench would transition to the north side of the existing tunnel. At 8<sup>th</sup> Street SE, the temporary runaround track/trench would transition back to the south side of the existing tunnel. It should be noted that when the runaround track is moved to the north side of the existing tunnel between 2<sup>nd</sup> and 5<sup>th</sup> Streets SE, this concept conforms essentially to Concept 3. As is under Concepts 2 and 3, the runaround track would be removed upon completion of the rebuilt Virginia Avenue Tunnel.

### 3.2.1.5 Concept 5: Rebuild, Permanent Two Tunnels (New Tunnel on South Side of Existing Virginia Avenue Tunnel)

The rebuilt Virginia Avenue Tunnel under Concept 5 would be different than any of the previously described rebuild concepts with the exception of Concept 3A, which was added after the identification of the original 11 concepts. Concept 5 would result in the construction of two single-track/double-stack tunnels (see Figure 3-5).

Figure 3-5  
Concept 5 Typical Section



Concept 5 would avoid having to construct temporary facilities to maintain freight operations during construction. One of the single-track/double-stack tunnels would occupy the space generally within the existing tunnel envelope. The other would have an alignment very similar to the alignment of the temporary runaround track/trench under Concept 2, or along the south side of the existing tunnel. The south side single-track/double-stack tunnel would be constructed first. During construction of the south side tunnel, freight traffic would continue to use the existing Virginia Avenue Tunnel. After the new south side tunnel is completed, train traffic would cut over to this new tunnel and the existing, older tunnel would be reconstructed and converted into a new single-track/double-stack tunnel. Both new tunnels would be constructed using a cut-and-cover method. Upon completion of Concept 5, train traffic would be split with traffic in each tunnel.

#### 3.2.1.6 Concept 6: Rebuild with On-Line Construction

Concept 6 would be similar to Concepts 2, 3 and 4 in that it would result in largely the same kind of new two-track/double-stack tunnel within the existing tunnel envelope (see Figure 3-6). Concept 6 is different from Concepts 2 to 5 in that a runaround track/trench or new single-track tunnel would not be used to maintain freight rail traffic during construction. Instead, Concept 6 would involve construction of a new permanent tunnel in short segments while maintaining freight rail traffic in one half of the tunnel at all times. Demolition of the old tunnel and construction of the new tunnel would occur in numerous stages with regularly shifting track alignments and all work occurring in very close proximity to live train traffic, allowing trains to continue to use the tunnel though the construction work area on a daily basis. (Note that additional engineering analysis on Concept 6, after it was developed into Alternative 4, showed that a larger trench would be needed for both maintaining freight rail operations and rebuilding the tunnel).

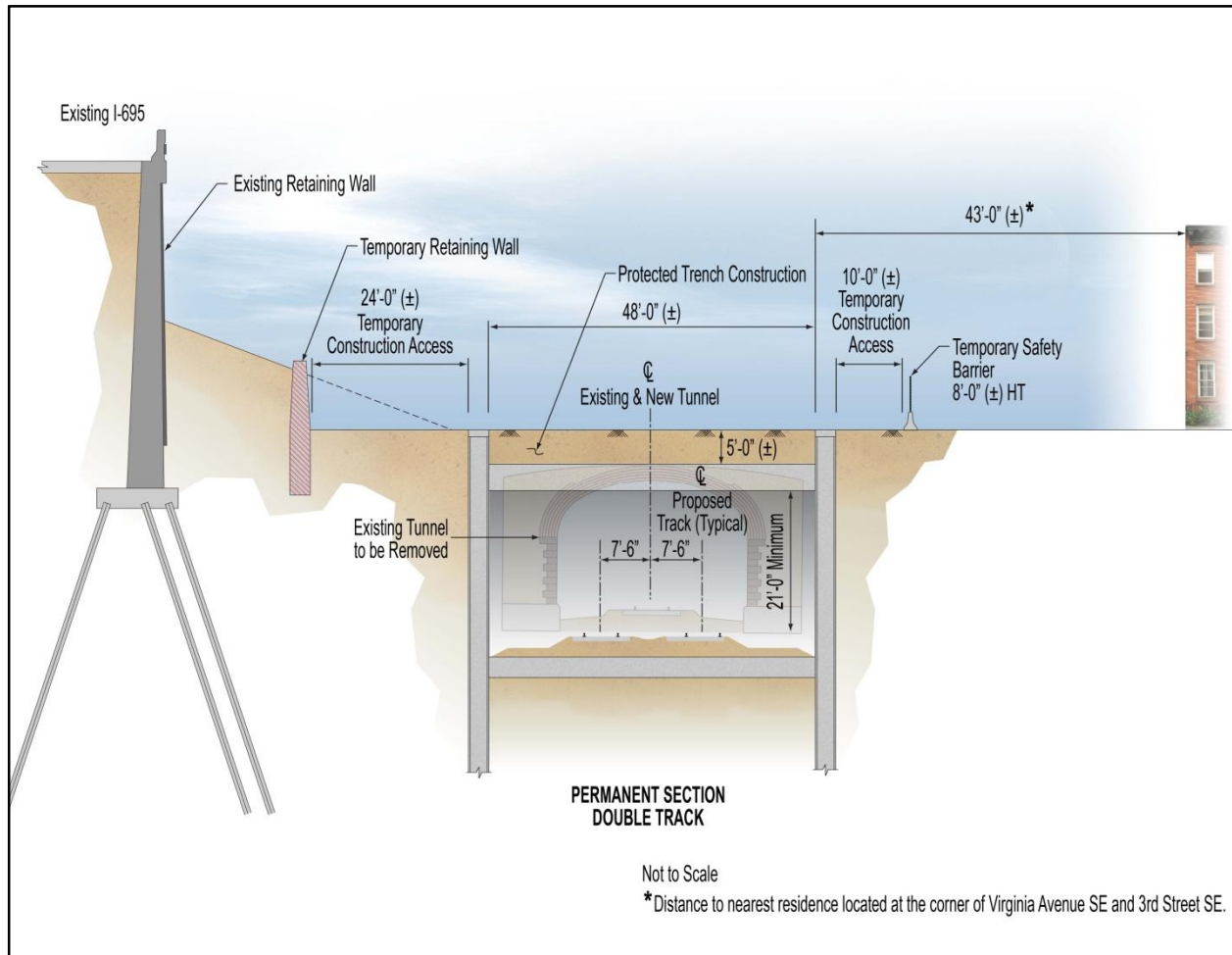
Concept 6 would require substantial daily coordination between the train operators and the construction contractor to safely allow trains to pass through the construction zone on set schedules. Inevitably, this extremely complicated coordination has the potential to cause delays to both freight rail operations and construction, as well as increase community impacts because of the increased duration of construction in the Virginia Avenue SE neighborhood. The contractor would be under the daily obligation to ensure the rail lines through the work area are operational at all times.

#### 3.2.1.7 Concept 7: Rebuild, Temporary Reroute

Concept 7 is similar to the Concepts 2, 3, 4 and 6 in that the rebuilt Virginia Avenue Tunnel would be reconstructed generally within the existing horizontal envelope of the existing tunnel (see Figure 3-7). Instead of accommodating the train traffic within the Virginia Avenue SE corridor as would be done under Concepts 2 through 6, Concept 7 would close the tunnel to all traffic during construction. Therefore, Concept 7 unlike the other concepts would not be able to maintain the same level of service to Washington Metropolitan Area regional customers

during construction. It would create logistical problems in the rerouting of trains to maintain service to these customers.

Figure 3-6  
Concept 6 Typical Section

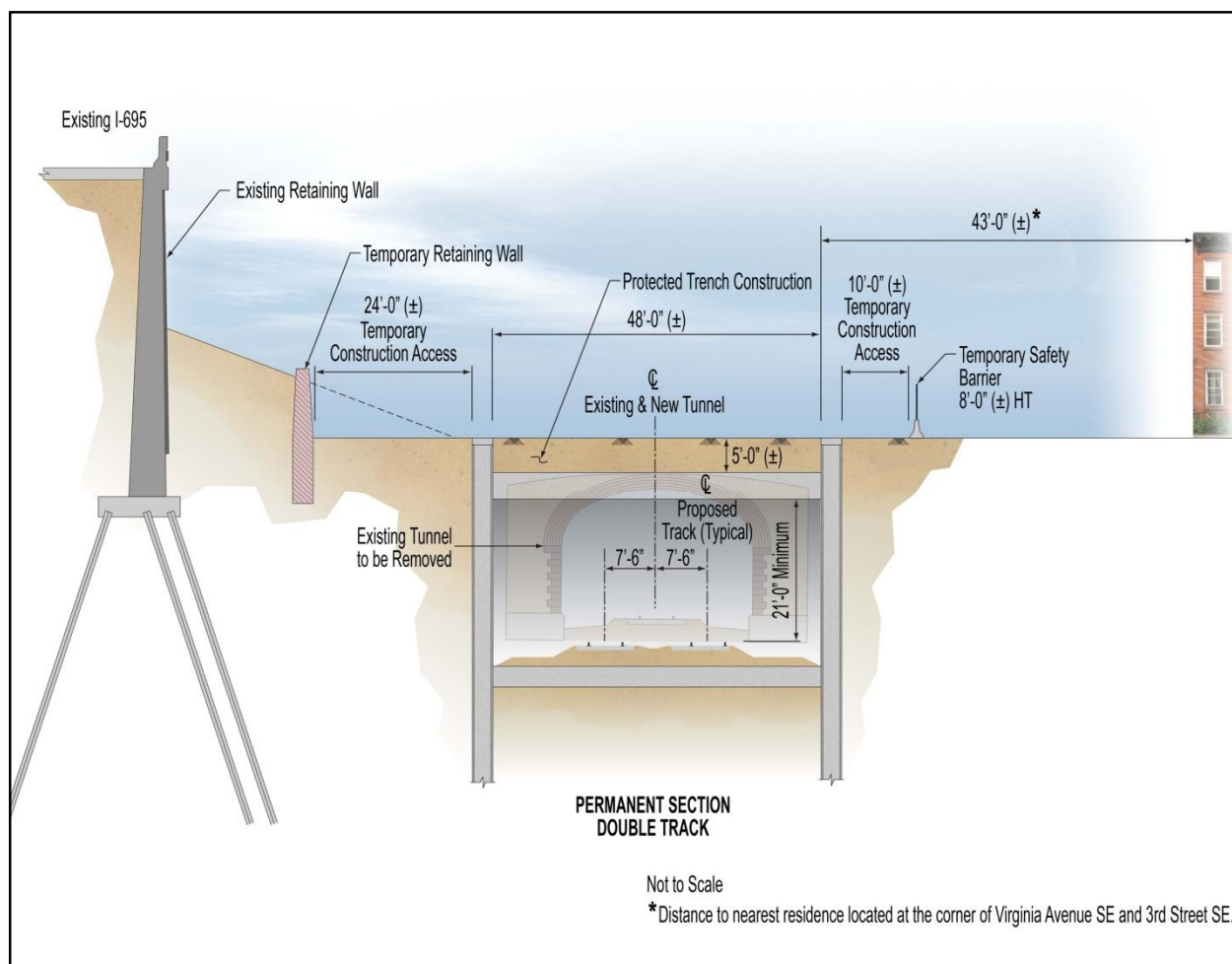


Concept 7 would temporarily detour freight trains through other rail routes within and outside the District. Figure 1-3 in Chapter 1 depicts the existing rail network in the District of Columbia, including the rail lines used by passenger carriers, such as AMTRAK and VRE. Routing freight trains through Union Station (a passenger train station) would maintain the connectivity of the freight rail network through the District. However, a maximum of one freight train per day would be able to move through Union Station in each direction, due to the constraints of existing passenger rail service. In addition, each freight train would require equipment changes before it could traverse Union Station. Because of the capacity constraints of the route through Union Station, freight rail traffic must operate over other principal routes throughout the



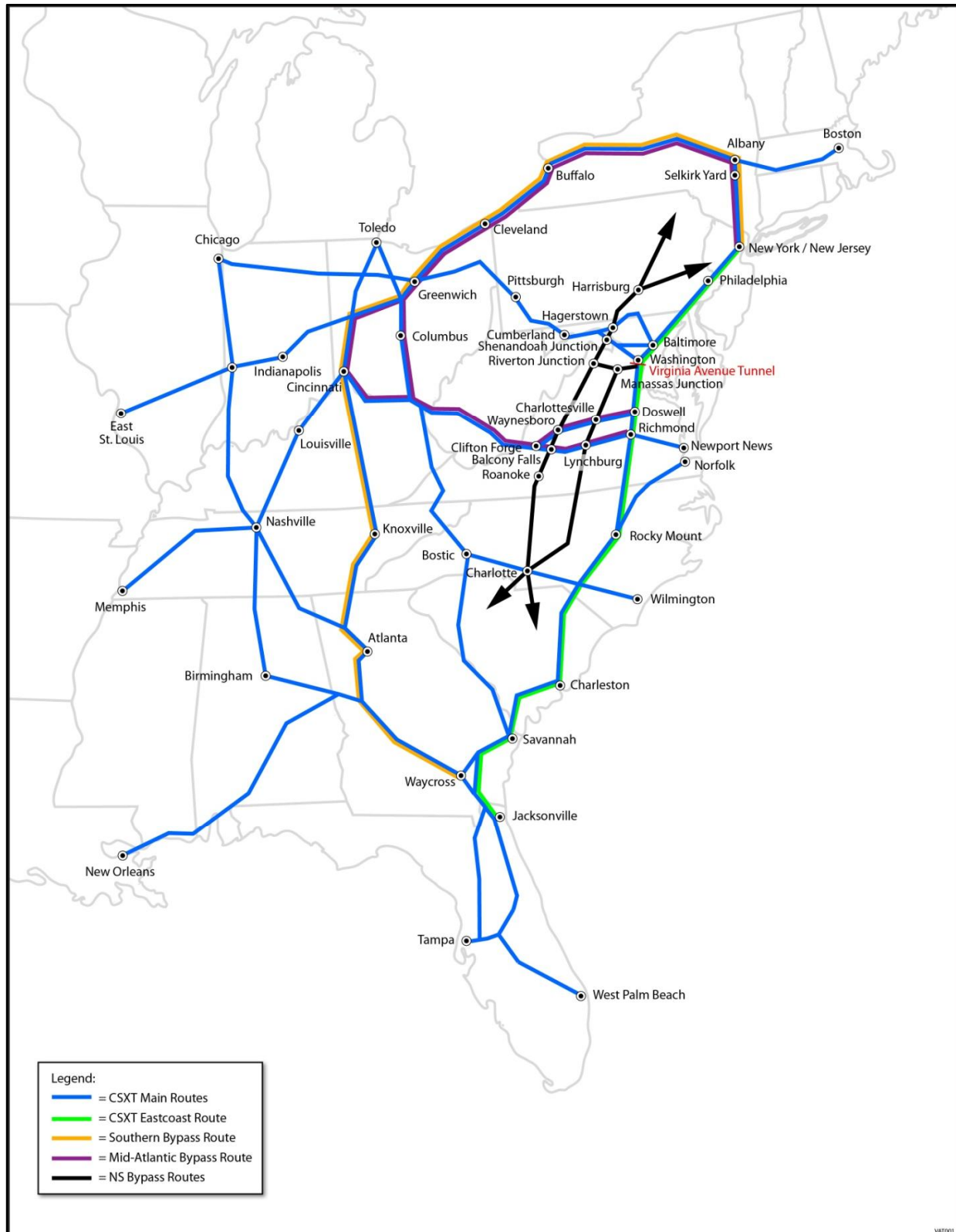
eastern seaboard. Each of these bypass options involve substantial additional train mileage and transit time. Figure 3-8 displays the potential bypass routes, which are briefly discussed below.

Figure 3-7  
Concept 7 Typical Section



*CSXT Southern Bypass Route* – Northbound trains originating in Florida and destined for northeastern points would divert from the eastern seaboard freight rail corridor route at Waycross, GA and be routed through Atlanta GA, Knoxville TN, Cincinnati and Cleveland OH, Buffalo NY, and into Selkirk Yard (located in the vicinity of Albany NY). Southbound trains originating at Selkirk Yard would use the reverse routing to Waycross GA. From Selkirk Yard, freight trains could access markets in New Jersey, New York City, and New England. Baltimore/Philadelphia markets could be accessed via route running through Pittsburgh PA and Cumberland MD. The segment between Waycross, GA and Cleveland (Greenwich), OH is essentially a single-track rail line with passing sidings, and much of it is already at or near capacity.

Figure 3-8  
Temporary Detours outside the District under Concept 7



CSXT Mid-Atlantic Bypass Route - Northbound trains originating in the Carolinas would use the eastern seaboard freight rail corridor route to Richmond VA, then divert to the Mid-Atlantic Route and proceed through Lynchburg and Clifton Forge VA, Huntington WV, Columbus and Cleveland OH, and on to Selkirk Yard. As with the Southern Bypass, the Mid-Atlantic Bypass adds over 800 miles to the overall route to New Jersey points. Half of the segment between Richmond, VA and Huntington, WV is a single-track rail line, and is in mountainous areas used frequently by coal trains. In addition, westbound trains traveling from Richmond has no efficient means to connect with Lynchburg and head north. A complicated and time-consuming maneuver involving the uncoupling of locomotives from one end of the train and coupling the locomotives on the other end would be required. Moreover, each of these train movements requires crossing over mainline tracks that are used by approximately 20 AMTRAK trains daily. Essentially, using the Mid-Atlantic Bypass Route is not a feasible operation for multiple freight trains per day.

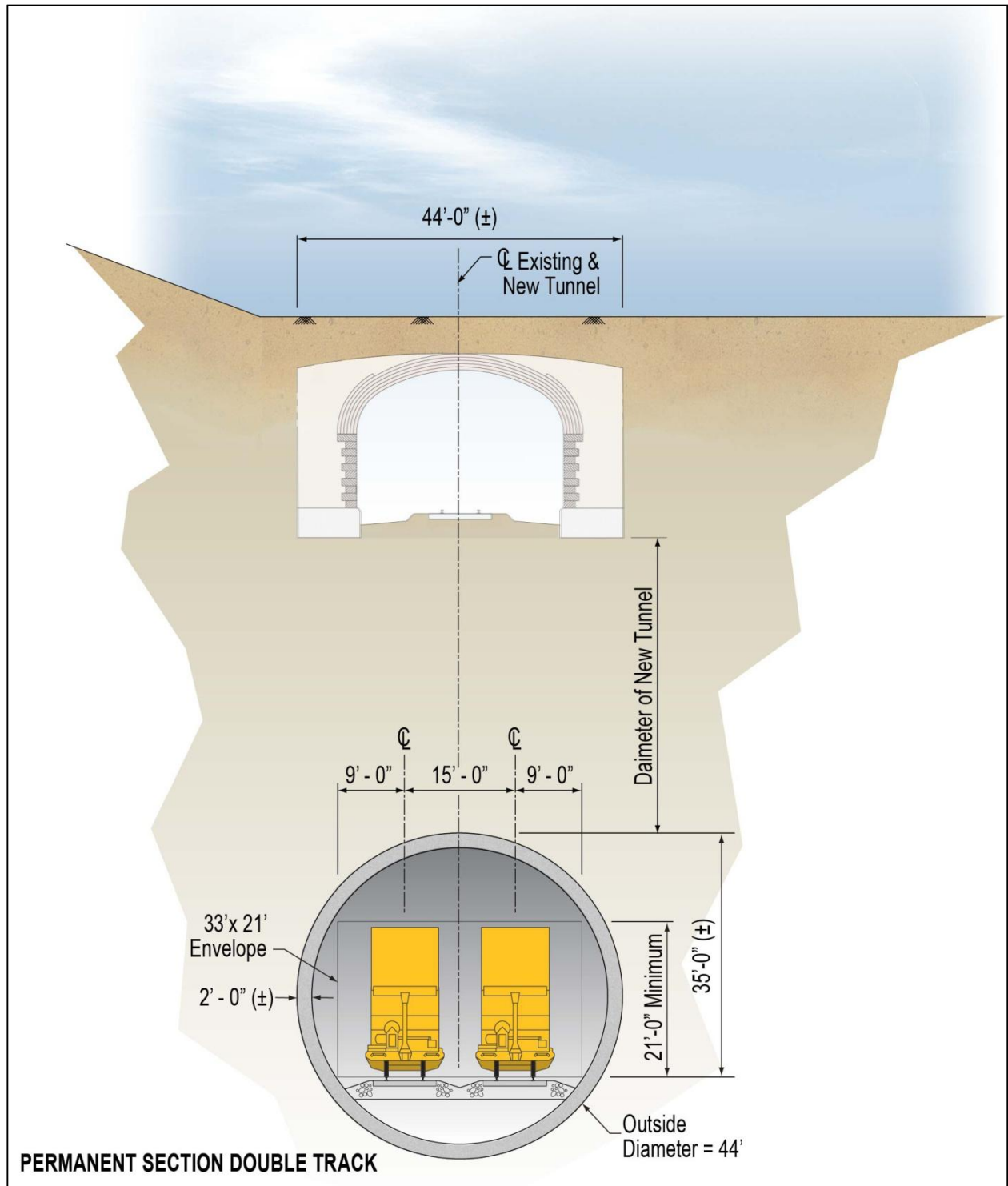
CSXT Mid-Atlantic Bypass Route (Doswell) – A variation Mid-Atlantic Bypass would deviate from eastern seaboard freight rail corridor route in Doswell VA, rejoining the bypass route in Clifton Ford, VA. The route segment between Doswell and Clifton Forge is operated by the Buckingham Branch Railroad. Although CSX has rights to use this rail line primarily as a relief route for returning empty coal trains, it is not feasible to support high density freight traffic due to its low speed limit (25 mph), and lack of sufficient siding length and space (distance between each siding) and steep grades.

Norfolk Southern (NS) I-83 Hagerstown Route – Another possible bypass route involves using the NS I-83 freight rail route that traverses the Shenandoah Valley from Charlotte NC through Roanoke VA, Hagerstown MD and Harrisburg PA. Beyond Harrisburg PA, a number of NS routes are available that enable access to the New Jersey area. As a NS route, train movement and track sharing would have to be negotiated before any CSX trains could use it. NS would maintain absolute control of dispatching and the guest railroad trains (CSX) are allowed access as the opportunity permits. Although rerouting is a common railroad practice under emergency conditions that are usually short in duration, negotiating a 2 plus-year operating agreement would be very difficult. Notwithstanding agreement issues, using the I-83 NS route presents operational challenges. Essentially, the NS I-83 corridor route has extremely limited in line capacity. The corridor has a single railroad track, a limited number of sidings, and much of the corridor consists of curved track and low speed limits.

### 3.2.1.8 Concept 8: Reroute, Deep Bore Tunnel

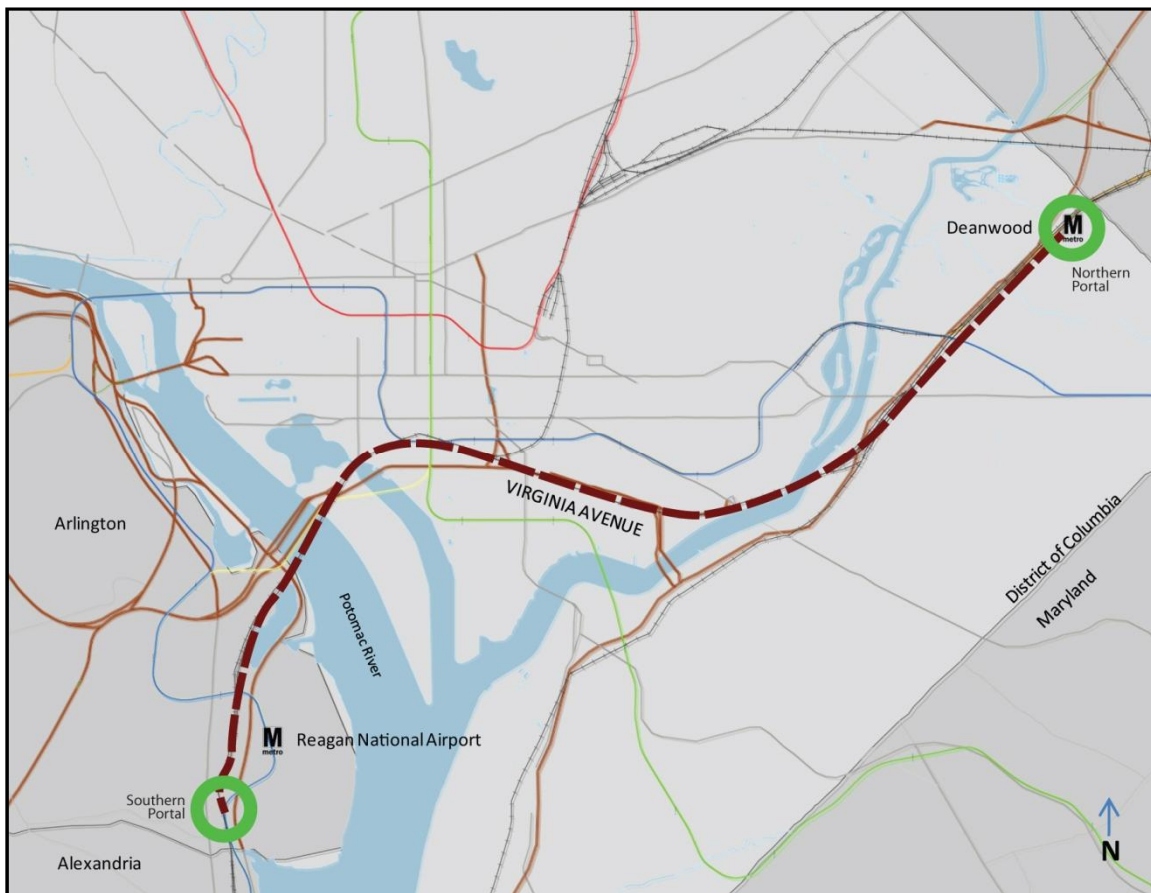
Concept 8 would establish a new two-track/double-stack tunnel approximately 80 feet below the surface of Virginia Avenue SE (i.e. approximately 45 feet below the existing tunnel) (see Figure 3-9). This depth is needed to maintain a stable foundation under the existing tunnel while the new tunnel is being excavated. The purpose of Concept 8 would be to maintain the existing mainline freight rail route through Washington, DC, but avoid the need for construction on Virginia Avenue SE. Rail operations would continue using the existing Virginia Avenue Tunnel for service Washington Metropolitan Area and regional customers. Constructing this

Figure 3-9  
Concept 8 Typical Section



tunnel would require the use of tunnel boring equipment, and would not require any major construction activity on city streets, including Virginia Avenue SE. The diameter of the tunnel would be approximately 44 feet wide, which would be wide enough to accommodate two-track/double-stack facilities. In order to reach a depth of 80 feet in the area of the existing tunnel while also maintaining appropriate separation from other existing features along the route (i.e., river crossings and WMATA tunneling), the portals of the new tunnel would be located no closer than an area near the south of Reagan National Airport in Alexandria, VA on the west end and near the Deanwood Metrorail Station on the east end, making the minimum length of the tunnel approximately nine miles (see Figure 3-10). For the construction of the transition area at each portal, a minimum of 14-16 acres would be required. In addition, numerous ventilation shafts along the entire tunnel length would be needed, most of which would be sited in urban areas.

Figure 3-10  
Concept 8 Tunnel Alignment and Portal Locations



There are several reasons for the 9-mile tunnel length. The maximum permissible grade for freight trains operating on this corridor is 1.25 percent. The portal would have to be located at

least 6,400 feet from the bottom of the slope. With a 1.25 percent grade and with the existing tunnel at approximately 3,800 feet long, a deep bore tunnel would be no shorter than approximately 16,600 feet, or a little more than three miles. Second, several natural and manmade obstructions would prevent the minimum length of a deep bore tunnel with grades of 1.25 percent. The natural obstructions include the Anacostia and Potomac Rivers. For example, because of the relatively close proximity of the Anacostia River to the current east portal, the deep bore tunnel's rise to surface level elevation could not begin until the tunnel is on the east side of the river. The manmade obstructions include underground structures associated with freeway over- and under-passes, underground utilities including large combined sewer overflow (CSO) trunk lines, and underground transportation facilities, such as Metrorail tunnels and the 12<sup>th</sup> Street, 1<sup>st</sup> Street and I-395 tunnels. The manmade obstructions would affect the tunnel length and depth on the west side, and would force the deep bore tunnel's rise to surface level elevation to begin on the west side of the Potomac River. Finally, the length of the deep bore tunnel under Concept 8 would be affected by keeping the tunnel within the existing CSX right-of-way within the District, Maryland and Virginia.

### 3.2.1.9 Concept 9: Reroute NCPC Indian Head Alignment

Concept 9 was taken from a study conducted by the National Capital Planning Commission (NCPC) in 2007 titled, the Railroad Realignment Feasibility Study. The NCPC study identified alternative routes to divert the majority of the freight traffic on the I-95 corridor away from the District, but still within the Washington Metropolitan Area. Concept 9 would use an alignment called the Indian Head Alignment, which was identified in the NCPC study (see Figure 3-11). Under Concept 9, a new mainline rail route would be established through the greater Washington Metropolitan Area.

From Virginia, the Indian Head alignment would diverge from the existing mainline rail tracks north of Arkendale, and cross the Potomac River via a new two-track 2.5-mile-long bridge. On the east side of the river, a new two-track railroad would be built and connect with the existing single-track Indian Head Branch, and the single-track Pope's Creek Branch. The sections of the Indian Head and Pope's Creek Branch affected by this alignment would require two-track expansion, including, where necessary, changes in grades or bridge or overpass structures to allow double-stack operations. North of Bowie, MD the alignment would run parallel to the Amtrak Northeast Corridor, and a new two-track railroad would be built between the Patuxent River and MD 32 to the mainline traversing through Jessup, MD.

### 3.2.1.10 Concept 10: Reroute, NCPC Dahlgren Alignment

Concept 10 was also taken from the 2007 NCPC study. It would use an alignment called the Dahlgren Alignment (see Figure 3-12). The purpose of Concept 10 is the same from Concept 9: instead of making the necessary capital improvements to maintain the existing mainline route through Washington, DC, it would establish a new mainline route through the greater Washington Metropolitan Area.



Figure 3-11  
Concept 9, NCPC Indian Head Alignment

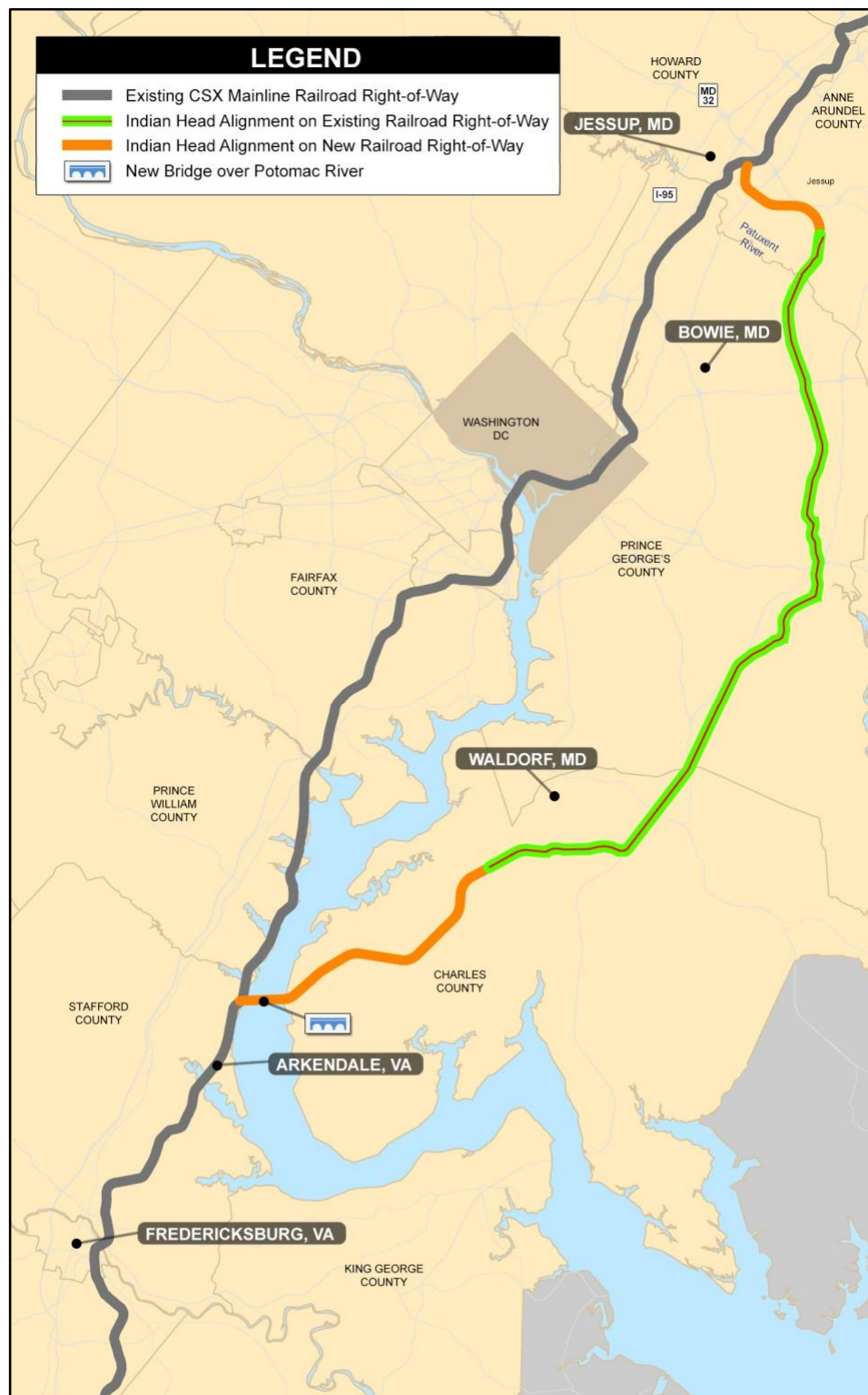
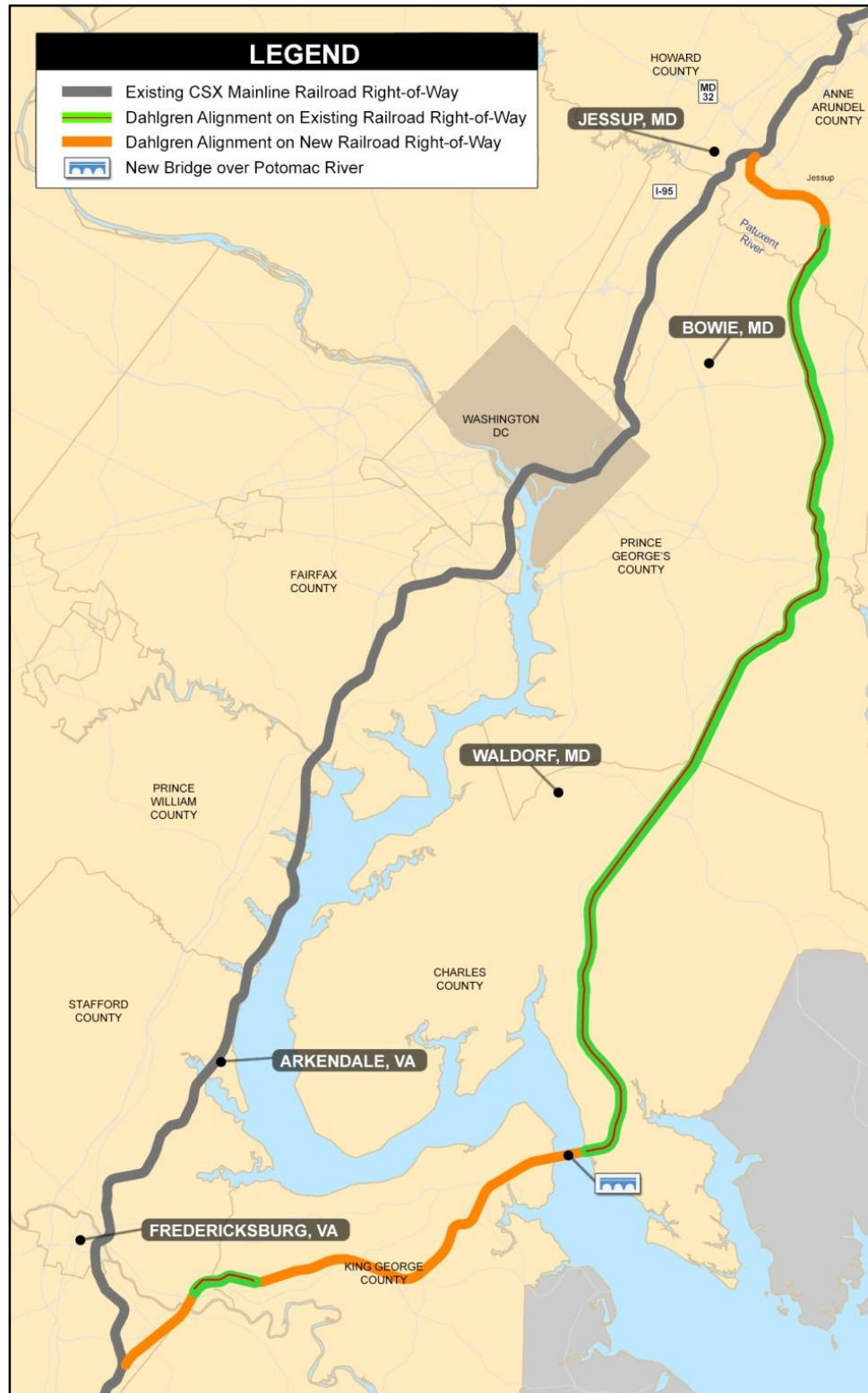


Figure 3-12  
Concept 10, NCPD Dahlgren Alignment





From Virginia, the Dahlgren alignment would diverge from the existing mainline rail tracks just south of Fredericksburg where a new two-track railroad would be constructed that would traverse across King George County. From just south of Fredericksburg, the alignment of Concept 10 would follow an existing utility corridor right-of-way, cross the Rappahannock River and connect with the abandoned Dahlgren rail line, which would be restored to a functioning two-track railroad. This restored rail line would then parallel the recently completed Dahlgren Railroad Heritage Trail for a short distance before establishing new rail line that would partially be aligned with the U.S. 301 to the Potomac River. At the Potomac River, a new two-mile-long railroad drawbridge would be constructed near the existing U.S. 301 Bridge. The alignment would connect with the southern terminus of single-track Pope's Creek Branch, which would require two-track expansion. At and north of Waldorf, the Dahlgren alignment is the same as the Indian Head alignment.

#### 3.2.1.11 Concept 11: Reroute, Permanent Reroute

Concept 11 involves no proposed construction or upgrades to the existing Virginia Avenue Tunnel, and would establish new permanent routes using existing railroads owned by CSX throughout the eastern part of the U.S. This concept would continue operations in the existing Virginia Avenue Tunnel SE while permanently routing freight trains outside the District (see Figure 3-8). Concept 11 would use the same routes as Concept 7. However, the reroutes would be permanent under this concept, and would require substantial upgrades.

The differences between Concepts 7 and 11 is the duration of rerouting (temporary versus permanent), and the impacts associated with the durations. Similar to Concept 7, freight traffic must operate over other principal routes and all bypass options involve significant additional train mileage and running time. These potential bypass routes are discussed under Concept 7 and are illustrated in Figure 3-8.

#### 3.2.2 Evaluation Criteria and Screening Process

This section describes the eight evaluation criteria and explains how each concept was measured against the criteria. The project concepts were introduced to the public during the November 30, 2012 public meeting. Following this and other smaller group meetings, the concepts evaluation criteria were developed and applied.

Criteria 1 through 4 are based on the Project Purpose and Need described in Chapter 1. Criteria 5 through 8 address issues of technical and economic feasibility, such as impacts on freight traffic and cost, as well as impacts to the community, including the duration of construction along Virginia Avenue SE. Detailed descriptions of the criteria are provided in the Concepts Evaluation Technical Report provided in Appendix B. The criteria and their application are described below.

Criterion 1: The concept, upon completion, will address the deficiencies of the Virginia Avenue Tunnel.

In order for a concept to meet Criterion 1, Virginia Avenue Tunnel must be rebuilt to modern engineering standards, while at the same time eliminating the bottleneck on the I-95 mainline rail corridor, a vital segment of the nation's rail network. The elimination of the bottleneck does not necessarily have to be through the Virginia Avenue corridor in order to partially meet this objective.

Criterion 2: The concept, upon completion, will provide the necessary improvements for operating double-stack intermodal containers and have two tracks for the efficient flow of commercial rail freight through the Washington Metropolitan Area.

In order for a concept to meet Criterion 2, the Project must result in two railroad tracks with sufficient clearance to accommodate double-stack containers on rail cars throughout the Washington Metropolitan Area.

Criterion 3: The concept will avoid major impacts to the structures, traffic or access to or from I-695.

Only rebuild concepts (Concepts 2 through 7) that involve a short-term temporary closure of I-695 ramps meet Criterion 3. Rebuild concepts that involve long-term closure of an I-695 ramp or re-construction of any structural element of I-695 (e.g., columns, retaining walls, etc.) do not meet Criterion 3. Obviously, Concepts 8 through 11, which do not require construction along the surface streets, including Virginia Avenue SE, would meet Criterion 3. However, it is uncertain, and beyond the scope of this analysis, to predict how the massive railroad construction contemplated by any of these concepts (including construction of a new rail bridge across the Potomac River) could affect interstate highways and other major roads.

Criterion 4: The concept must allow for the maintenance of traffic across Virginia Avenue and along adjacent streets throughout the duration of construction.

In order to meet Criterion 4, the concept must have the potential to include effective traffic management measures to maintain cross-street traffic across Virginia Avenue for motorists, pedestrians and cyclists, and vehicle access to and from I-695.

Criterion 5: The concept will maintain interstate rail commerce without a substantial negative impact to the level of service during construction.

This criterion requires a dependable level of timely freight transportation services in the Washington Metropolitan Area throughout the duration of construction. If a concept is unable to maintain the existing level of service, it would fail to meet Criterion 5.

Criterion 6: The concept will be implemented in a time frame that accommodates the near term anticipated increase in freight traffic.

As a practical matter, Criterion 6 requires that double-stack intermodal container train operations be available through the Washington Metropolitan Area by 2015, the year in which the Panama Canal is projected to be expanded allowing passage of larger vessels with higher freight capacity. A concept does not necessarily have to be fully constructed by 2015 in order to meet Criterion 6 if it includes temporary measures that maintain freight operations through the Washington Metropolitan Area with the ability to operate double-stack intermodal container freight trains.

Criterion 7: The concept has a comparatively reasonable duration of construction in the vicinity of the existing tunnel.

In order to determine if a concept meets Criterion 7, the expected length of construction for each of the 12 concepts were compared. The concepts with the shorter construction periods within the Virginia Avenue SE corridor satisfy Criterion 7.

Criterion 8: The concept has a comparatively low cost.

Under Criterion 8, a comparatively low cost essentially means a cost that is practical and feasible from an economic standpoint. To apply Criterion 8, a cost comparison of the 12 concepts was conducted. The concepts in the lower range of overall costs meet Criterion 8. Concepts with costs orders of magnitude greater than the lower cost concepts would not satisfy Criterion 8.

### 3.2.3 Concepts Dismissed from Further Consideration

This section provides a summary of how each concept was evaluated and rated against the eight criteria described in Section 3.2.2. Table 3-1 summarizes the findings of the concepts screening evaluation. The table qualitatively scores each concept against the eight evaluation criteria. Scoring is based on ability of each concept to either meet the criteria, failure to meet the criteria, or uncertainty in meeting the criteria. The scores on the table also reflect situations where the criteria are simply not applicable to concepts. The Concepts Evaluation Technical Report in Appendix B contains a point-by-point descriptive evaluation of the alternative concepts against the criteria. It also provides more information on why certain concepts were eliminated from detail study as formal alternatives in the Draft EIS.

Based on the evaluation, all of the reroute concepts (Concepts 8 through 11) were eliminated from further consideration. In summary, the major reasons for eliminating the reroute concepts include:

Table 3-1  
Concepts Evaluation Matrix

Project Criteria		No Build	Rebuild Tunnel Concepts							Reroute Freight Traffic Concepts			
		1	2	3	3A	4	5	6	7	8	9	10	11
1	The concept, upon completion, will address the deficiencies of the Virginia Avenue Tunnel.												
2	The concept, upon completion, will provide the necessary improvements for operating double-stack intermodal containers and have two tracks for the efficient flow of commercial rail freight through the Washington Metropolitan Area.												
3	The concept will avoid major impacts to the structures, traffic or access to or from I-695.												
4	The concept must allow for the maintenance of traffic across Virginia Avenue and along adjacent streets throughout the duration of construction.												
5	The concept will maintain interstate rail commerce without a substantial negative impact to the level of service during construction.												
6	The concept will be implemented in a time frame that accommodates the near term anticipated increase in freight traffic.												
7	The concept has a comparatively reasonable duration of construction in the vicinity of the existing tunnel.												
8	The concept has a comparatively low cost.												

Legend:

	Yes
	Requires more study
	No
	N/A

- Concept 8, Reroute, Deep Bore Tunnel, which failed three of the evaluation criteria, would require acquisition of 14 to 16 acres at portal locations and the construction of ventilation shafts in urban areas. It would have an extremely high cost (estimated to cost approximately \$2 billion) and require extensive planning efforts across multiple jurisdictions.
- Concept 9, Reroute, NCPC Indian Head Alignment, which failed three of the evaluation criteria, would require a new bridge over the Potomac River and 31 miles of new rail line. It would traverse several communities, would affect diverse natural resources, would have an extremely high cost (NCPC estimated to cost between \$3.2 and \$4.2 billion), and would require extensive planning efforts across multiple jurisdictions.
- Concept 10, Reroute, NCPC Dahlgren Alignment, which failed three of the evaluation criteria, would require a new bridge over the Potomac River and 38 miles of new rail line. Like Concept 9, it would traverse several communities, would affect diverse natural resources, would have an extremely high cost (NCPC estimated to cost between \$3.5 and \$4.7 billion), and would require extensive planning efforts across multiple jurisdictions.
- Concept 11, Permanent Reroute, which failed four of the evaluation criteria, would include substantial diversion of freight traffic to trucks or other modes of transportation, with associated impacts to interstate highway congestion, higher fuel consumption, and increased pollution.

Concepts 3, 3A and 7 were also eliminated from further consideration. Concepts 3 and 3A failed to meet one of the criteria based on the Project's Purpose and Need. Concept 7 failed to meet Criteria 5 and 6. In summary, the major reasons for eliminating these concepts include:

- Concept 3, Rebuild, Temporary North Side Runaround, would result in major impacts to I-695 during construction.
- Concept 3A, Rebuild, Permanent Two Tunnels (New Tunnel on North Side of Existing Virginia Avenue Tunnel), would also result in major impacts to I-695 during construction.
- Concept 4, Rebuild, Combination Runaround, would require two major disruptions to freight rail operations, causing stoppages of freight train movements for several weeks for each disruption.
- Concept 7, Rebuild, Temporary Reroute, would result in a substantial degradation of freight rail service to growing customer demands in the I-95 corridor

The following remaining concepts were retained as Build Alternatives for detailed evaluation in this Draft EIS:

- Concept 2: Rebuild Virginia Avenue Tunnel, Temporary South Side Runaround
- Concept 5: Permanent Two Tunnels (New Tunnel on South Side of Existing Virginia Avenue Tunnel)
- Concept 6: Rebuild Virginia Avenue Tunnel, Rebuild With On-Line Construction

Detailed descriptions of each Build Alternative are presented in the following section. A description of Alternative 1 (No Build) is provided in Section 3.1.

### 3.3 Project Description

The retained concepts were developed as project alternatives, and given descriptive names:

- Alternative 1: No Build
- Alternative 2: Rebuilt Tunnel / Temporary Runaround Track
- Alternative 3: Two New Tunnels
- Alternative 4: New Partitioned Tunnel / Online Rebuild

This section provides detailed descriptions of Alternatives 2, 3 and 4. These are referred to in this DEIS as the 'Build Alternatives'. Alternative 1 is referred to as the 'No Action' or 'No Build' Alternative.

To meet the Project's Purpose and Need, each of the candidate Build Alternatives would result in two railroad tracks that could accommodate double-stack intermodal container freight trains. Under each of the Build Alternatives, the railroad bed crossing underneath New Jersey Avenue SE would be lowered to accommodate double-stack intermodal container freight trains.

Regardless of Build Alternative, the total length of the rebuilt Virginia Avenue Tunnel would be extended by approximately 330 feet on the east end. The new east tunnel portal would be located northeast of the existing M Street SE / 12<sup>th</sup> Street SE T-intersection. Extending the tunnel east by approximately 330 feet and completion of a DDOT planned project to convert the Southeast Freeway to an urban boulevard between 11<sup>th</sup> Street SE and Barney Circle would allow DDOT to connect 12<sup>th</sup> Street SE between K and M Streets SE. This would support Anacostia Waterfront Initiatives to better connect the waterfront with the larger Capitol Hill neighborhood.

Subsequent to the series of public meetings leading up to this Draft EIS, additional engineering evaluation was done on the selected Build Alternatives. The notable engineering modifications of the alternatives from their original concepts were made mainly to avoid risking the structural integrity of the nearby and adjacent I-695. In order to assure that the structural integrity of I-695 and associated infrastructure remains intact, most of the existing north wall of the tunnel (the wall nearest to I-695) is expected to remain in place under all three Build Alternatives. However, Alternative 4 would remove most of the north wall along the east end of the tunnel in order for this alignment to fit within modifications of the 11<sup>th</sup> Street Bridges currently being done by DDOT.

The modifications to the build alternatives are as follows:

- Alternative 2 (Rebuilt Tunnel / Temporary Runaround Track):
  - Due to new columns associated with the rebuilt 11<sup>th</sup> Street Bridges, the temporary runaround track would slightly separate from the tunnel alignment on the east end starting just west of Virginia Avenue Park.
  - The centerline of the rebuilt two-track tunnel would be aligned approximately seven feet south of the existing tunnel centerline. Concept 2 showed a centerline as being the same as the existing tunnel.
- Alternative 3 (Two New Tunnels):
  - The west portal at 2<sup>nd</sup> Street SE would be a single two-track portal rather than two single-track portals. This modification means that during construction, freight trains

- would operate in a protected open trench for approximately 230 feet immediately east of the 2<sup>nd</sup> Street portal (within the Virginia Avenue SE segment between 2<sup>nd</sup> and 3<sup>rd</sup> Streets SE). Within the remainder of the tunnel limits, freight trains would operate in an enclosed tunnel throughout the construction duration.
- From 3<sup>rd</sup> to 9<sup>th</sup> Streets SE, the two single railroad track tunnels would be separated by a center wall.
  - From 3<sup>rd</sup> to 9<sup>th</sup> Streets SE, the centerline of the two tunnels, represented by the center wall, would be aligned approximately 25 feet south of the existing tunnel centerline.
  - From 9<sup>th</sup> Street SE to the east portal at 12<sup>th</sup> Street SE, the tunnels would be separated starting just west of Virginia Avenue Park, resulting in two single-track tunnels. This is due to new columns associated with the rebuilt 11<sup>th</sup> Street Bridges.
  - Alternative 4 (New Partitioned Tunnel / Online Rebuild):
    - Instead of a single two-track tunnel, the rebuilt tunnel would consist of two single-track tunnels separated by a center partition wall.
    - The centerline of the rebuilt tunnel, represented by the center partition wall, would be aligned approximately 17 feet south of the existing tunnel centerline.

For each alternative, two phases are evaluated: 1) construction; and 2) post-construction.

The construction description includes:

- Limits of disturbance, which includes the construction staging and stockpiling areas, and identifying streets that would be closed during construction;
- Phasing plan, which describes the general construction methods and activities for each Build Alternative;
- Access points and haul routes for construction vehicles;
- Maintenance of traffic (MOT) plan that would indicate how public traffic would be accommodated with the planned street closures and how properties located along or near street closures would keep their public access;
- Safety and security measures;
- Estimated duration of construction; and
- Estimated construction costs.

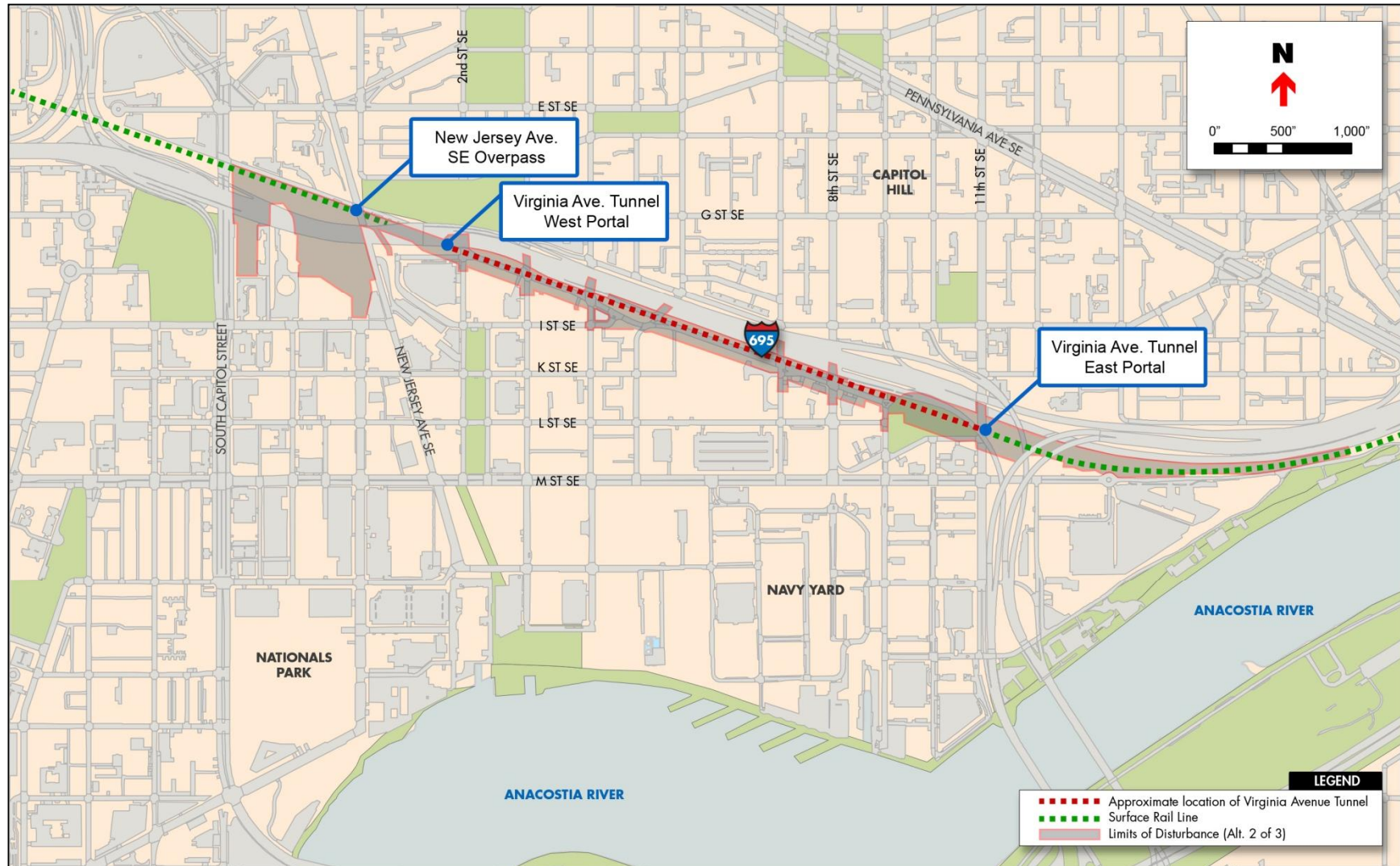
The post-construction description includes the physical condition of the rebuilt Virginia Avenue Tunnel under each of the three Build Alternatives, and the elements of a post-construction streetscape of Virginia Avenue SE between 2<sup>nd</sup> and 9<sup>th</sup> Streets SE.

### 3.3.1 Construction Period Conditions

#### 3.3.1.1 Limits of Disturbance

The Limits of Disturbance (LOD), which is depicted in Figure 3-13, means all areas where construction would take place, including areas needed for staging, materials stockpiling, utility relocations, and temporary freight train operations. More detailed depictions of the proposed LOD for the Build Alternatives are provided in Appendix C. The LOD basically represents the areas

Figure 3-13  
Limits of Disturbance during Construction under Alternatives 2 and 3





affected by construction and would be restricted from the general public, except Virginia Avenue's cross streets, which would remain open for public passage throughout construction by means of temporary bridges (see Sections 3.3.1.2 and 3.3.1.4). Other areas outside of the LOD would be subject to minor construction work associated with MOT detours, such as re-striping, removing or modifying parking meters, modifying curb lines at intersections for turning movements, modifying existing traffic signal systems including adding temporary signals, widening roadway pavement as required, and resurfacing affected areas. These areas are shown in the depictions provided in Appendix C.

Alternatives 2 and 3 would have identical LODs because the alignments of the temporary runaround track/trench under Alternative 2 and the new south side single-track tunnel under Alternative 3 are the same.

Alternatives 2 and 3's LOD would encompass the following areas, and involve various construction activities as noted below:

- CSX-owned rail right-of-way between the South Capitol Street Overpass and the Virginia Avenue Tunnel west portal. For both Alternatives 2 and 3, this area would be used to convert the single-track configuration to a double-track configuration immediately west of the tunnel portal at 2<sup>nd</sup> Street SE, and to lower the rail bed beneath the New Jersey Avenue to accommodate double-stack intermodal container freight trains.
- Virginia Avenue SE (eastbound) public right-of-way between 2<sup>nd</sup> and 9<sup>th</sup> Streets SE, which would be needed to construct:
  - Temporary runaround track/ protected trench and rebuilt two-track Virginia Avenue Tunnel (Alternative 2), or
  - Partitioned single-track tunnels (Alternatives 3 and 4).
- Virginia Avenue Park between 9<sup>th</sup> Street and 11<sup>th</sup> Street SE: Same as Virginia Avenue SE (eastbound) right-of-way. A portion of the park would be temporarily used for the LOD. This would not include the portion of the park used as a community garden and the picnic benches located along Potomac Avenue SE. For Alternatives 2 and 3, the LOD would widen from just west of Virginia Avenue Park to the 11<sup>th</sup> Street Bridge right-of-way because the alignment of the temporary runaround track (Alternative 2) and the south side permanent single-track tunnel (Alternative 3) would bend slightly south to avoid new columns installed for the current 11<sup>th</sup> Street Bridge Project. The park would be restored to at least the pre-construction condition at the end of construction.
- Area between Virginia Avenue Park and 11<sup>th</sup> Street Bridge public right-of-way between I-695 and Potomac Avenue SE: Same as Virginia Avenue SE (eastbound) right-of-way.
- CSX-owned rail right-of-way between the east tunnel portal at and up to approximately 1700 feet east: For all Build Alternatives, this area would be used to convert the single-

track configuration to a two-track configuration immediately east of the tunnel portal just west of 12<sup>th</sup> Street SE.

- Public right-of-way directly beneath the I-695 structure between Garfield Park and Virginia Avenue SE in the vicinity of 2<sup>nd</sup> Street SE: This area is needed to relocate a large sewer line (Tiber Creek & New Jersey Avenue High Level Intercepting Sewer) under all three Build Alternatives.
- Portions of 2<sup>nd</sup> to 9<sup>th</sup> Streets SE public right-of-way at their intersections with Virginia Avenue SE: These areas would be used to maintain surface traffic during construction, including the installation of temporary bridges to maintain cross-street traffic. See Section 3.3.1.4 for further information.
- L Street between 8<sup>th</sup> and 9<sup>th</sup> Streets SE: This area would be used to maintain surface traffic during construction, but no construction would be needed other than installation of temporary traffic signals and re-striping for two-way operations. This area is not considered part of the LOD. See Section 3.3.1.4 for further information.
- Approximately 40 feet wide section of U.S. Marine Corps property between Copper Senior Homes and 7<sup>th</sup> Street SE: This area would be used to construct the temporary runaround track/ protected trench (Alternative 2), or the south side single-track tunnel (Alternative 3). The Marine Corps property may also be used to relocate certain utilities affected by the Project. The property would be restored to at least the pre-construction condition at the end of construction.
- Jersey Rail Yard, a CSX-owned property located directly south of the CSX rail right-of-way between New Jersey Avenue SE and South Capitol Street: This area would be used for construction staging, vehicle and equipment storage, worker parking, contractor offices, for the temporary materials stockpiles and a community outreach office.

The LOD for Alternative 4 would be the same as Alternatives 2 and 3 except along the south edge of Virginia Avenue between 2<sup>nd</sup> and 11<sup>th</sup> Streets SE portals, and in Virginia Avenue Park. The Alternative 4's LOD along Virginia Avenue SE would be a few feet narrower and be slightly smaller in the park.

While it is possible that the LOD may be adjusted later during final design or construction due to new information, DDOT will be informed of any adjustment that increases the size of the LOD. Most of the LOD is constrained, especially along Virginia Avenue SE and the CSX right-of-way. The LOD does not include private property, nor would it be expanded into private property during final design.

### 3.3.1.2 Phasing

Construction of the Project would be complex. This section provides an explanation of the major steps needed to complete the construction for each of the Build Alternatives, which are

illustrated in Tables 3-2 through 3-4. It should be noted that the cross sectional views of Alternatives 2, 3 and 4 shown on these tables are different than what are described in Sections 2.2.1.1, 2.2.1.5 and 2.2.1.6 for Concepts 2 (Alternative 2), 5 (Alternative 3) and 6 (Alternative 4), respectively. This is due to additional engineering design work that was performed specifically on these alternatives. Although final design is unlikely to cause any major changes to the steps described in Tables 3-2 through 3-4, situations that could cause deviation from these steps are unknown at this time.

Construction of the Project would be accomplished in segments, with some activities being potentially more noticeable than others. Although construction would proceed in phases or segments, the LOD, as described in Section 3.3.1.1, would remain secured throughout most of construction.

### 3.3.1.3 Access and Haul Routes

In addition to the LOD, construction area access points for construction vehicles and designated haul routes were identified and are shown in Figure 3-14. The access points apply to all three Build Alternatives. The haul routes correspond to designated construction area access points at the following locations that match the numbered spots shown in Figure 3-14:

1. South Capitol Street from the Jersey Rail Yard
2. I Street SE from the Jersey Rail Yard
3. 1<sup>st</sup> Street SE and H Street SE
4. 2<sup>nd</sup> Street SE at Virginia Avenue SE
5. 3<sup>rd</sup> Street at Virginia Avenue SE
6. 4<sup>th</sup> Street at Virginia Avenue SE
7. I Street SE at Virginia Avenue SE
8. 5<sup>th</sup> and 6<sup>th</sup> Street SE at Virginia Avenue SE
9. 7<sup>th</sup> Street SE at Virginia Avenue SE
10. 8<sup>th</sup> Street SE at Virginia Avenue SE
11. 9<sup>th</sup> Street SE at Virginia Avenue SE
12. L Street SE between 10<sup>th</sup> and 11<sup>th</sup> Streets SE
13. L Street SE and 11<sup>th</sup> Street SE
14. M Street SE adjacent to the CSX rail right-of-way

The haul trucks would enter or exit the construction area from I-395, South Capitol Street and the 11<sup>th</sup> Street Bridge (I-695). The latter two roadways provide connections to I-295. I-395 connections would be made through South Capitol Street and I and M Streets SE, in addition to I-695 ramps at 3<sup>rd</sup> and 6<sup>th</sup> Streets SE. South Capitol Street connections would be made through I and M Streets SE. 11<sup>th</sup> Street Bridge connections would be made through M Street SE.

At any given day, haul routes noted on Figure 3-14 could be modified due to a number of reasons, such as road closures and vehicle accidents. Any permanent changes to these designated haul routes would be coordinated with DDOT.

Table 3-2  
Alternative 2 Construction Phasing

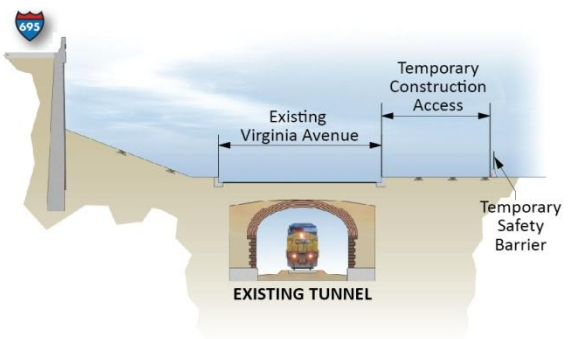
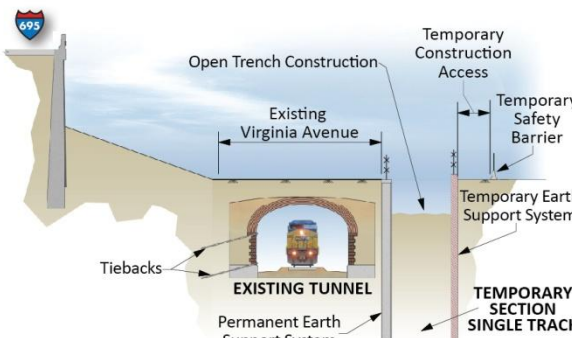
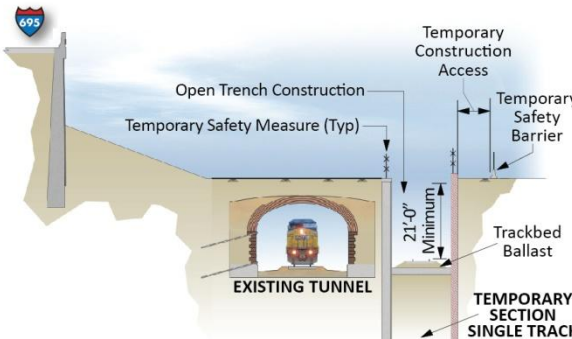
Step	Major Activities
<p>Step 1</p> 	<ul style="list-style-type: none"> <li>• Set up the maintenance of traffic (MOT) measures</li> <li>• Partially close Virginia Avenue SE to traffic</li> <li>• Initiate utility relocations (concurrent with other activities)</li> <li>• Remove roadway asphalt and other hard surfaces.</li> <li>• Erect temporary bridge crossings at intersections over temporary runaround trench location</li> <li>• Install safety barriers around construction site</li> </ul>
<p>Step 2</p> 	<ul style="list-style-type: none"> <li>• Install a temporary earth support system on the south side of the runaround trench</li> <li>• Install a permanent earth support system on the north side of the runaround trench (this would form the south side wall of the rebuilt tunnel)</li> <li>• Begin excavation of the runaround trench from the top (open trench construction)</li> <li>• Install tiebacks in the existing tunnel's north side wall</li> </ul>
<p>Step 3</p> 	<ul style="list-style-type: none"> <li>• Complete trench excavation</li> <li>• Install track bed ballast, temporary tracks and other train operations signals and communication equipment</li> </ul>

Table 3-2 (Continued)  
Alternative 2 Construction Phasing

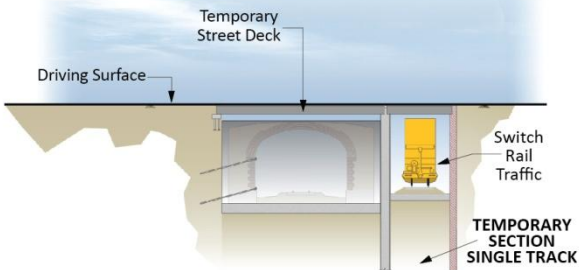
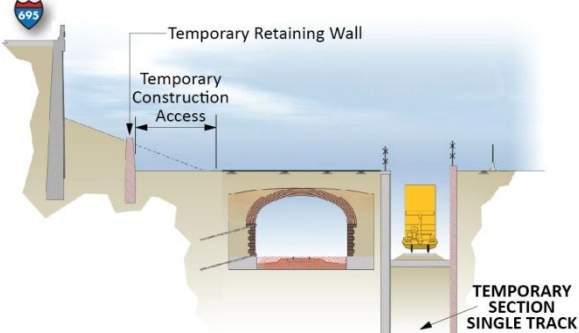
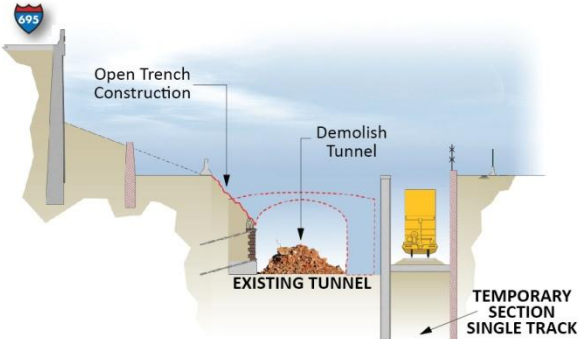
Step	Major Activities
<p>Step 4</p> 	<ul style="list-style-type: none"> <li>• Install temporary bridge crossings over existing tunnel alignment</li> <li>• Install track cut-over at each end of the tunnel to switch train route from the existing tunnel to the temporary runaround trench</li> <li>• Begin operating trains through the temporary runaround trench and remove all train operations from existing tunnel</li> </ul>
<p>Step 5</p> 	<ul style="list-style-type: none"> <li>• Partially cut toe of embankment slope on the north side of Virginia Avenue SE and install temporary retain wall</li> <li>• Provide construction access on the north side of the existing tunnel</li> </ul>
<p>Step 6</p> 	<ul style="list-style-type: none"> <li>• Demolish the tunnel (roof, south side wall, utilities, track work) from the top (open trench construction); north side wall remain</li> </ul>

Table 3-2 (Continued)  
Alternative 2 Construction Phasing

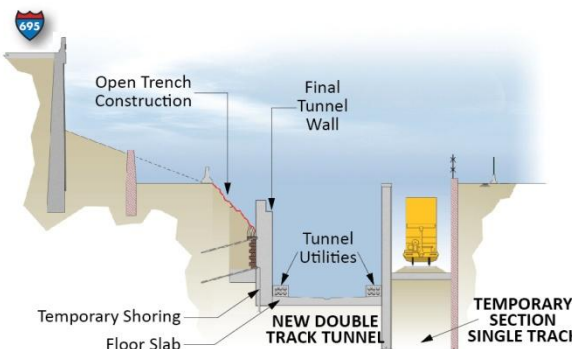
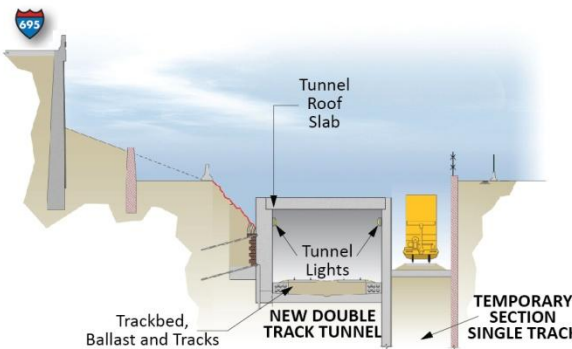
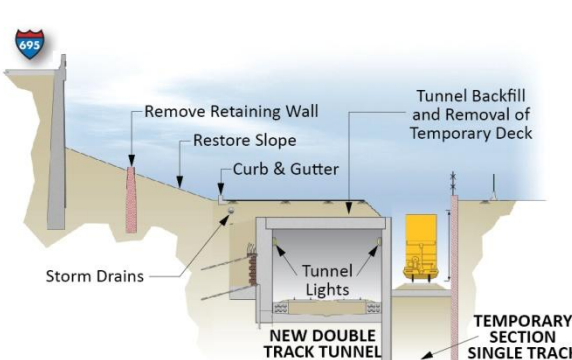
Step	Major Activities
<p>Step 7</p> 	<ul style="list-style-type: none"> <li>• Install temporary shoring along north side wall</li> <li>• Complete excavation of the new tunnel floor</li> <li>• Install concrete floor</li> <li>• Install new north side wall (inside old north side wall)</li> <li>• Begin utility installations</li> </ul>
<p>Step 8</p> 	<ul style="list-style-type: none"> <li>• Install new track bed and ballast</li> <li>• Install tunnel roof slab</li> <li>• Install new tracks and related equipment (e.g., lighting)</li> </ul>
<p>Step 9</p> 	<ul style="list-style-type: none"> <li>• Backfill on top of tunnel roof</li> <li>• Remove embankment retaining wall and restore slope on the north side of Virginia Avenue SE</li> <li>• Remove temporary street decks over the rebuilt tunnel</li> <li>• Install storm drains</li> <li>• Begin construction of curbs and gutters</li> </ul>

Table 3-2 (Continued)  
Alternative 2 Construction Phasing

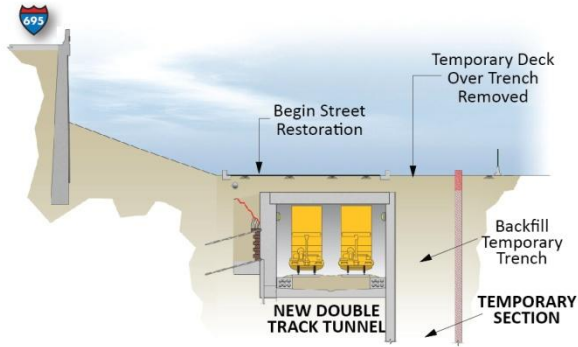

Step	Major Activities
<p>Step 10</p> 	<ul style="list-style-type: none"> <li>• Move trains to rebuilt tunnel</li> <li>• Remove temporary track work in the runaround trench</li> <li>• Backfill runaround trench and remove upper portion of temporary earth support on the south side of the trench (the bottom portion would remain)</li> <li>• Remove temporary street deck over temporary trench</li> <li>• Begin street restoration</li> <li>• Continue construction of storm drains, curbs and gutters</li> </ul>
<p>Step 11</p> 	<ul style="list-style-type: none"> <li>• Complete roadway surface restoration (street paving, sidewalks, lighting, striping etc.) and landscaping</li> <li>• Remove all remaining temporary barriers</li> <li>• Open Virginia Avenue SE to traffic</li> </ul>

Table 3-3  
Alternative 3 Construction Phasing

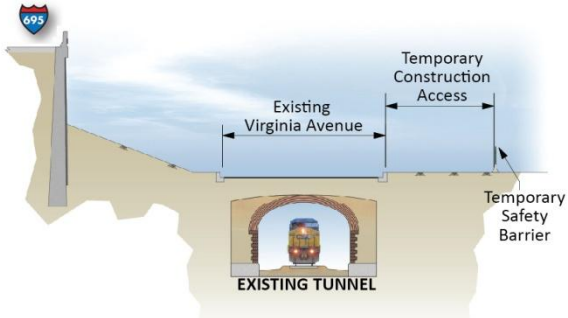
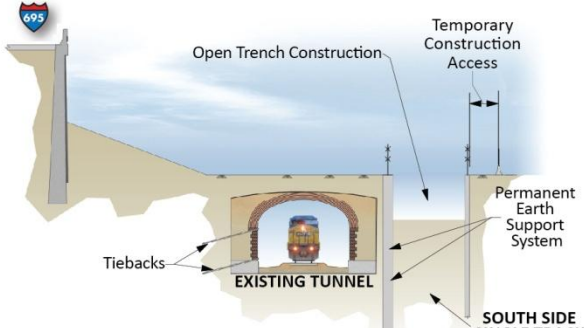
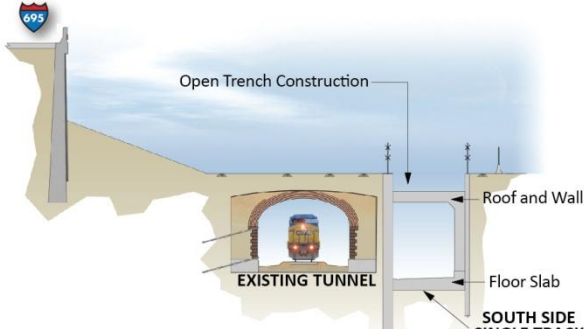
Step	Major Activities
<p>Step 1</p> 	<ul style="list-style-type: none"> <li>• Set up the maintenance of traffic (MOT) measures</li> <li>• Partially close Virginia Avenue SE to traffic</li> <li>• Initiate utility relocations (concurrent with other activities)</li> <li>• Remove roadway asphalt and other hard surfaces.</li> <li>• Erect temporary bridge crossings at intersections over south side tunnel alignment</li> <li>• Install safety barriers around construction site</li> </ul>
<p>Step 2</p> 	<ul style="list-style-type: none"> <li>• Install permanent earth support systems on both the north and south side of the south side tunnel alignment (north side support system would form the tunnel wall for both the south and north tunnels)</li> <li>• Begin excavation for the south side tunnel from the top (open trench construction)</li> <li>• Install tiebacks in the existing tunnel's north side wall</li> </ul>
<p>Step 3</p> 	<ul style="list-style-type: none"> <li>• Complete excavation needed for the south side tunnel</li> <li>• Install concrete floor slab for the south side tunnel</li> <li>• Install south side tunnel's roof and south wall</li> </ul>



Table 3-3 (Continued)  
Alternative 3 Construction Phasing


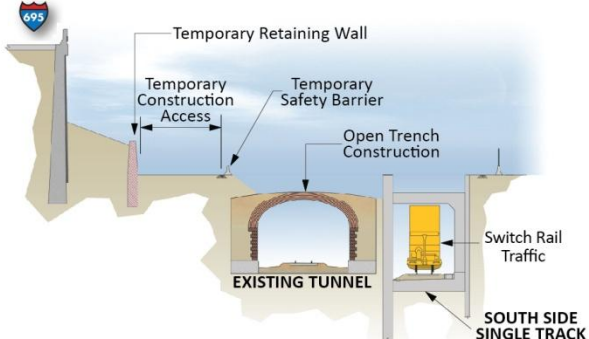
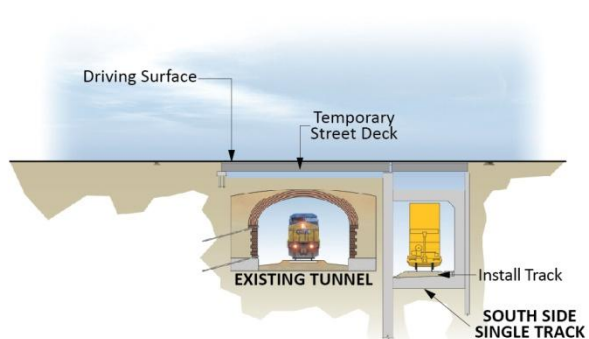
Step	Major Activities
<p>Step 4</p> 	<ul style="list-style-type: none"> <li>• Install utilities in the tunnel</li> <li>• Install track bed ballast, tracks and other train operations signals and communication equipment for the south side tunnel</li> </ul>
<p>Step 5 (Between Intersections)</p> 	<ul style="list-style-type: none"> <li>• Install track cut-over from existing tunnel to south side at each end of the tunnel</li> <li>• Begin to operate trains through the south side tunnel, and remove all train operations from existing tunnel</li> <li>• Partially cut toe of embankment slope on the north side of Virginia Avenue SE and install temporary retain wall</li> <li>• Provide construction access on the north side of the existing tunnel</li> <li>• Begin excavation over the existing tunnel</li> <li>• Install temporary bridge crossings over existing tunnel alignment at intersections</li> </ul>
<p>Step 5 (At Intersections)</p> 	

Table 3-3 (Continued)  
Alternative 3 Construction Phasing

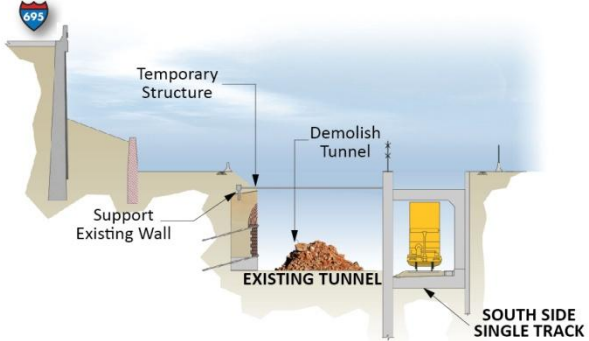
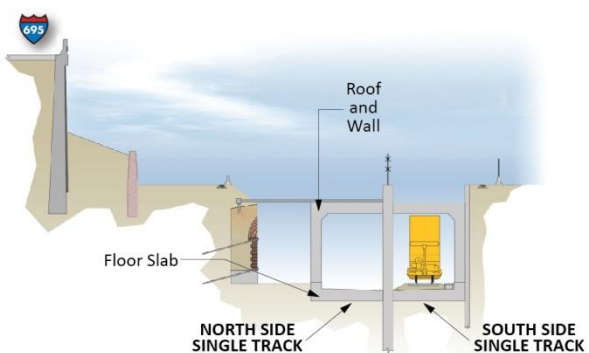
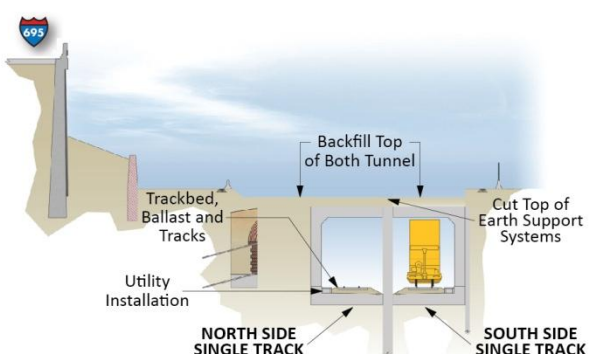
Step	Major Activities
<p>Step 6</p> 	<ul style="list-style-type: none"> <li>• Install temporary struts between existing wall and new wall</li> <li>• Demolish the tunnel (roof, south side wall, utilities, track work) from the top (open trench construction); north side wall remain</li> </ul>
<p>Step 7</p> 	<ul style="list-style-type: none"> <li>• Install concrete floor slab for the north side tunnel</li> <li>• Install north side tunnel's roof and north wall</li> </ul>
<p>Step 8</p> 	<ul style="list-style-type: none"> <li>• Install track bed ballast, tracks and other train operational signals and communication equipment for the north side tunnel</li> <li>• Complete utility installation in rebuilt tunnel</li> <li>• Remove the temporary struts</li> <li>• Backfill on top of both tunnels' roof</li> <li>• Remove temporary decks over the both tunnels</li> <li>• Cut top of the earth support systems</li> </ul>

Table 3-3 (Continued)  
Alternative 3 Construction Phasing

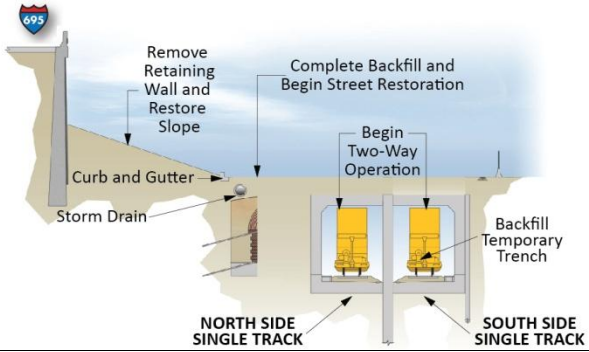
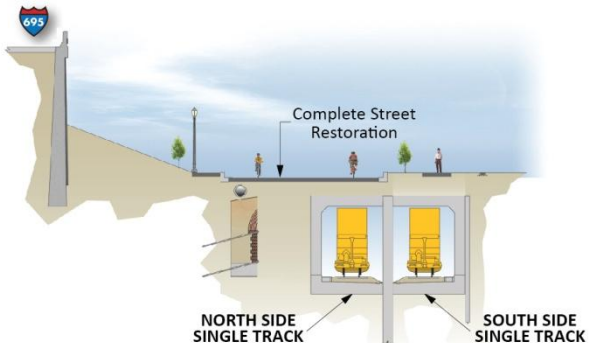
Step	Major Activities
<p>Step 9</p> 	<ul style="list-style-type: none"> <li>• Provide track connections for the north side tunnel at both ends of the tunnel portal</li> <li>• Begin two-way train operations utilizing both tunnels</li> <li>• Complete backfill over both tunnels</li> <li>• Remove embankment retaining wall and restore slope on the north side of Virginia Avenue SE</li> <li>• Install storm drains</li> <li>• Begin construction of curbs and gutters</li> <li>• Begin street utility restoration</li> </ul>
<p>Step 10</p> 	<ul style="list-style-type: none"> <li>• Complete roadway surface restoration (street paving, sidewalks, lighting, striping etc.) and landscaping Continue construction of storm drains, curbs and gutters</li> <li>• Remove all remaining temporary barriers</li> <li>• Open Virginia Avenue SE to traffic</li> </ul>

Table 3-4  
Alternative 4 Construction Phasing

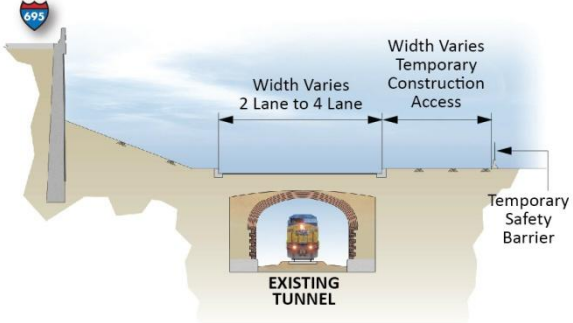
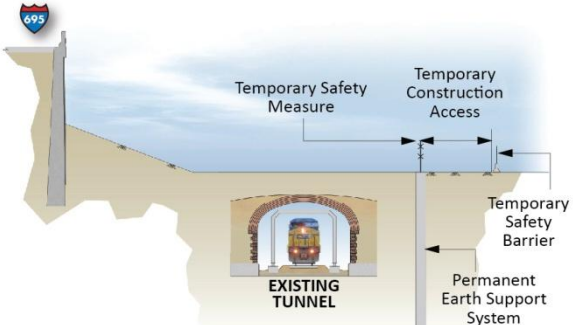
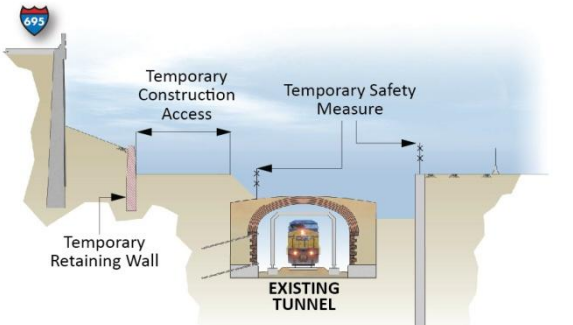
Step	Major Activities
<p>Step 1</p> 	<ul style="list-style-type: none"> <li>• Set up the maintenance of traffic (MOT) measures</li> <li>• Close Virginia Avenue SE to traffic (section between 4<sup>th</sup> and 9<sup>th</sup> Streets SE would remain open in the first several months of construction)</li> <li>• Initiate utility relocations (concurrent with other activities)</li> <li>• Remove roadway asphalt and other hard surfaces.</li> <li>• Erect temporary bridge crossings at intersections</li> <li>• Install safety barriers around construction site</li> </ul>
<p>Step 2</p> 	<ul style="list-style-type: none"> <li>• Install permanent earth support systems on the south side of the existing tunnel alignment</li> <li>• Install temporary anti-fall barrier over existing rail line in the tunnel</li> <li>• Establish temporary construction access on the south side of existing tunnel</li> </ul>
<p>Step 3</p> 	<ul style="list-style-type: none"> <li>• Partially cut toe of embankment slope on the north side of Virginia Avenue SE and install temporary retain wall</li> <li>• Provide construction access on the north side of the existing tunnel</li> <li>• Install tiebacks in the existing tunnel's north side wall</li> <li>• Initiate excavation over the existing tunnel and south up to the earth support system</li> </ul>

Table 3-4 (Continued)  
Alternative 4 Construction Phasing

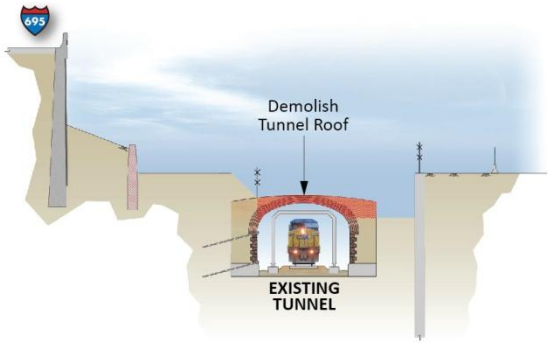
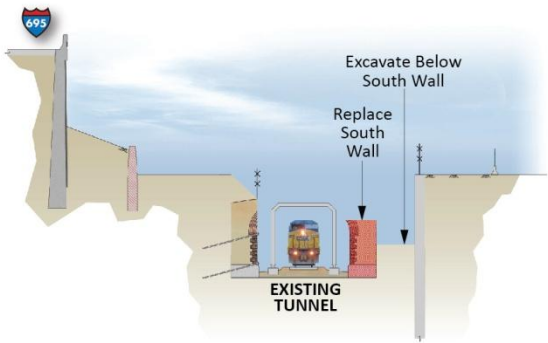
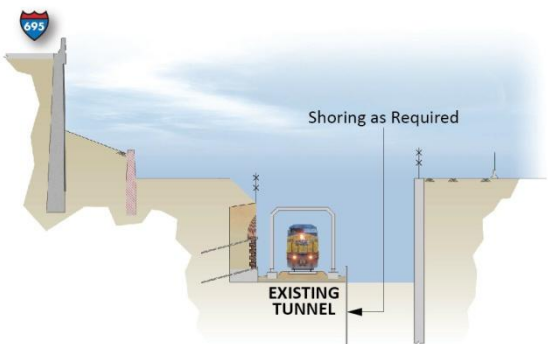
Step	Major Activities
<p data-bbox="456 405 529 436">Step 4</p> 	<ul style="list-style-type: none"> <li>Demolish tunnel roof (open trench construction)</li> </ul>
<p data-bbox="456 882 529 913">Step 5</p> 	<ul style="list-style-type: none"> <li>Remove south wall of existing tunnel</li> <li>Excavate below the south wall</li> </ul>
<p data-bbox="456 1358 529 1390">Step 6</p> 	<ul style="list-style-type: none"> <li>Install track shoring as required to protect the integrity of the existing track bed ballast</li> </ul>

Table 3-4 (Continued)  
Alternative 4 Construction Phasing sing

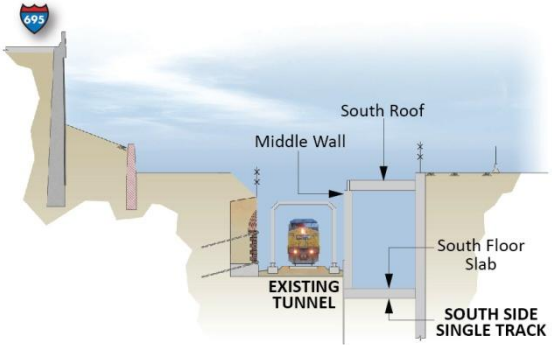
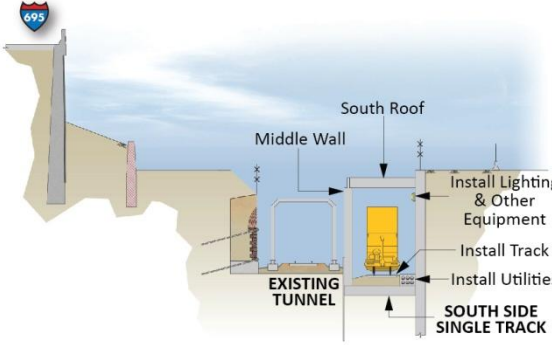
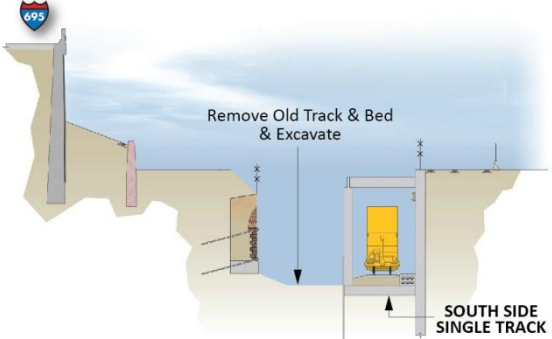
Step	Major Activities
<p>Step 7</p> 	<ul style="list-style-type: none"> <li>• Construct south side tunnel floor</li> <li>• Construct middle wall and roof for the south side single-track tunnel</li> </ul>
<p>Step 8</p> 	<ul style="list-style-type: none"> <li>• Install track bed ballast, tracks and other train operations signals and communication equipment for the south side tunnel</li> <li>• Install utilities in the south side tunnel</li> <li>• Install track cut-over from existing tunnel to south side at each end of the tunnel</li> <li>• Begin to operate trains through the south side tunnel, and remove all train operations from existing tunnel</li> </ul>
<p>Step 9</p> 	<ul style="list-style-type: none"> <li>• Remove old rails and track bed ballast</li> <li>• Excavate down to a depth matching the depth of the new south side single railroad track tunnel</li> </ul>

Table 3-4 (Continued)  
Alternative 4 Construction Phasing

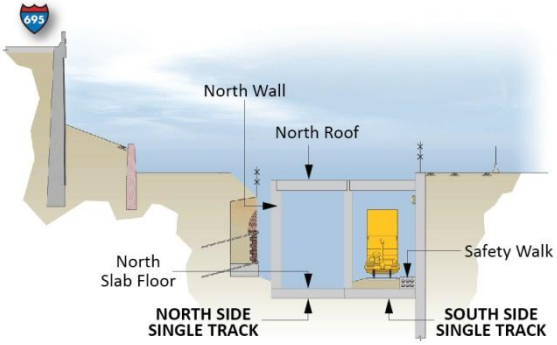

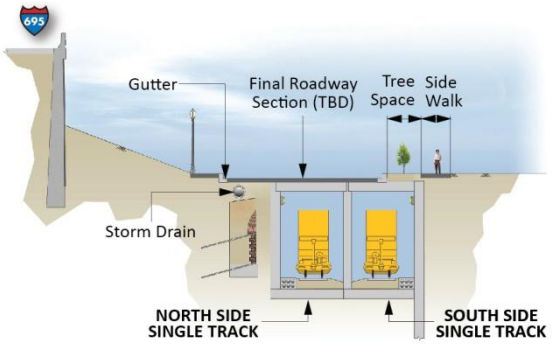
Step	Major Activities
<p>Step 10</p>  <p>The diagram shows a cross-section of the tunnel construction. On the left, a retaining wall is labeled 'North Wall'. Above it is the 'North Roof'. Below the roof is the 'North Slab Floor'. A 'Safety Walk' is shown on the right side of the tunnel. The 'NORTH SIDE SINGLE TRACK' and 'SOUTH SIDE SINGLE TRACK' are indicated at the bottom. A yellow train is shown inside the tunnel.</p>	<ul style="list-style-type: none"> <li>Construct north side tunnel floor</li> <li>Construct north side wall and roof for the north side single-track tunnel</li> </ul>
<p>Step 11</p>  <p>The diagram shows the next stage of construction. A 'Middle Wall' is added between the two tracks. Labels include 'Install Lighting &amp; Other Equipment' on the left, 'Install Track' and 'Install Utilities' at the bottom left, and 'Middle Wall' in the center. The 'NORTH SIDE SINGLE TRACK' and 'SOUTH SIDE SINGLE TRACK' are labeled at the bottom. A yellow train is shown in the north side track.</p>	<ul style="list-style-type: none"> <li>Install track bed ballast, tracks and other train operational signals and communication equipment for the north side tunnel</li> <li>Complete utility installation in the rebuilt tunnel</li> <li>Provide track connections for the north side tunnel at both ends of the tunnel portal</li> <li>Begin two-way train operations utilizing both tunnels</li> </ul>
<p>Step 12</p>  <p>The diagram shows the final stage of construction. Labels include 'Gutter' on the left, 'Final Roadway Section (TBD)' in the center, and 'Tree Side Space Walk' on the right. A 'Storm Drain' is shown on the left. The 'NORTH SIDE SINGLE TRACK' and 'SOUTH SIDE SINGLE TRACK' are labeled at the bottom. A yellow train is shown in the north side track.</p>	<ul style="list-style-type: none"> <li>Backfill on top of both tunnels' roof</li> <li>Remove temporary decks over the both tunnels</li> <li>Remove embankment retaining wall and restore slope on the north side of Virginia Avenue SE</li> <li>Install storm drains</li> <li>Complete roadway surface restoration (street paving, sidewalks, lighting, striping etc.) and landscaping Continue construction of storm drains, curbs and gutters</li> <li>Remove all remaining temporary barriers</li> <li>Open Virginia Avenue SE to traffic</li> </ul>



Figure 3-14  
Construction Haul Routes and Access Points



#### 3.3.1.4 Maintenance of Traffic and Property Access

As described in Section 3.3.1.1, the Project's construction LOD would include Virginia Avenue SE from 2<sup>nd</sup> to 11<sup>th</sup> Streets SE. Within these limits, Virginia Avenue SE would be closed to traffic throughout most of the construction duration. In order to maintain the same level of transportation connectivity during construction, (including ensuring that every property with street access maintains alternative access), a maintenance of traffic (MOT) plan was developed. This section contains a summary of the MOT. Certain properties currently have direct driveway access from Virginia Avenue SE within the LOD. Special provisions would be made during construction to keep access open on these properties for owners, users, and fire and emergency response vehicles.

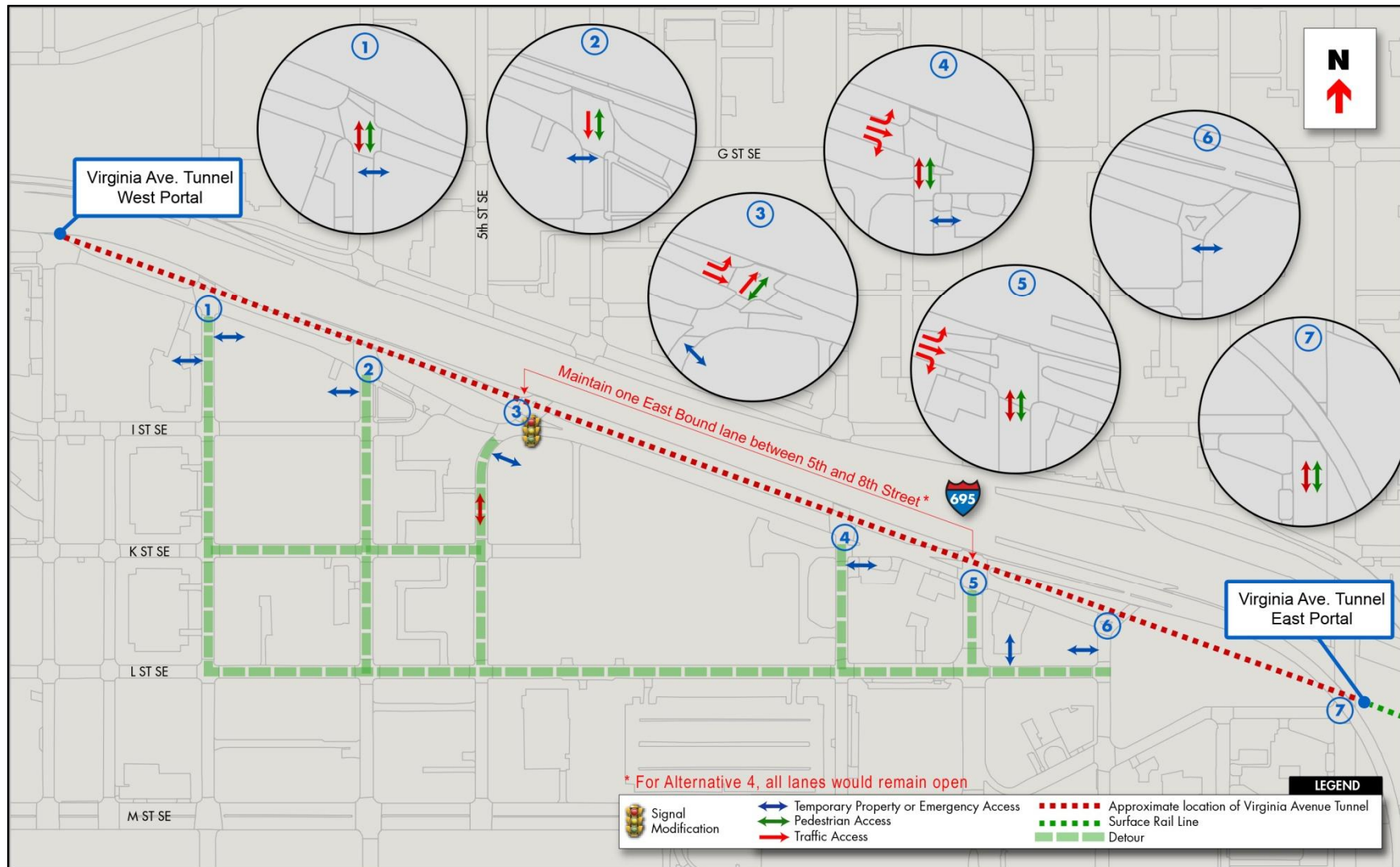
The MOT plan took into account other construction activities located in the general vicinity of the Project that are projected to overlap with the Project's construction, and would be re-evaluated during final design to determine the status of these and other construction projects in the general vicinity of the LOD.

Under Alternatives 2 and 3, a two-phased MOT would be implemented because portion of construction dedicated to the building of the temporary runaround track/trench (Alternative 2) or the south side single-track tunnel (Alternative 3) does not require closure of all of Virginia Avenue SE. Alternative 4's MOT would have the same phasing, but timed differently than Alternatives 2 and 3. Additional detail about Alternative 4's MOT is provided at the end of this section.

Under MOT Phase 1, a single eastbound lane on Virginia Avenue SE (northernmost lane) could be maintained between the I-695 off-ramp at 6<sup>th</sup> Street SE and the 8<sup>th</sup> Street SE intersections. Keeping this lane open would allow traffic exiting I-695 to make left turns at 7<sup>th</sup> and 8<sup>th</sup> Streets SE from the eastbound Virginia Avenue SE, the same movements currently allowed. For I-695 exiting traffic wishing to proceed to the south of Virginia Avenue SE, they would turn left at 6<sup>th</sup> Street SE, left on westbound Virginia Avenue SE (north side of I-695) and left on 4<sup>th</sup> Street SE. The other lanes and pedestrian facilities on Virginia Avenue SE within these limits would be closed. In addition, Virginia Avenue SE from 2<sup>nd</sup> to 5<sup>th</sup> Streets SE and from 8<sup>th</sup> to 9<sup>th</sup> Streets SE would be closed with traffic diverted to the parallel K and L Streets SE, and temporary decks over the temporary runaround trench (Alternative 2) or south side tunnel (Alternative 3) would be provided along all cross streets from 2<sup>nd</sup> to 8<sup>th</sup> Streets SE and 11<sup>th</sup> Streets SE (the deck at 2<sup>nd</sup> Street SE is only for pedestrians and cyclists). These and other elements of the MOT Phase 1 plan, including how properties adjacent to Virginia Avenue SE within the project limits would maintain access to the street grid, are shown in Figure 3-15.

MOT Phase 2 for Alternatives 2 and 3 would start when work on either the two-lane rebuilt tunnel (Alternative 2) or the north side tunnel (Alternative 3) begins, which would require closure of all of Virginia Avenue SE between 6<sup>th</sup> and 8<sup>th</sup> Streets SE. In order to maintain access for traffic exiting I-695 at the 6<sup>th</sup> Street off-ramp to the surrounding community, Virginia Avenue SE, on the north side of I-695, would be converted from one-way westbound to two-

Figure 3-15  
Alternatives 2, 3 and 4 Maintenance of Traffic Plan, Phase 1



way operations between 6<sup>th</sup> and 8<sup>th</sup> Street SE. Between 6<sup>th</sup> and 7<sup>th</sup> Streets SE, one westbound lane and two eastbound lanes would be provided throughout Phase 2. Between 7<sup>th</sup> and 8<sup>th</sup> Streets SE, one lane each direction would be provided throughout Phase 2.

Traffic from the freeway at 6<sup>th</sup> Street SE would be diverted to the reconfigured Virginia Avenue SE on the north side of I-695. From this location, traffic could proceed into three different directions (currently two directions are available): westbound, northbound or eastbound. For traffic exiting I-695 wishing to proceed to the south of Virginia Avenue SE, they would turn left at 6<sup>th</sup> Street SE. At the intersection with Virginia Avenue SE (north side of I-695), traffic could either turn left (as noted above under Phase 1) or turn right and make right turns at either 7<sup>th</sup> or 8<sup>th</sup> Street SE. The temporary decks at 2<sup>nd</sup> to 8<sup>th</sup> Streets SE and 11<sup>th</sup> Street SE would be extended over the expanded construction area. These and other elements of the MOT Phase 2 plan are shown in Figure 3-16.

As noted above, the MOT for Alternative 4 would be phased. The first several months of construction would be concentrated in the area between 2<sup>nd</sup> and 5<sup>th</sup>/6<sup>th</sup> Streets SE. The I-695 6<sup>th</sup> Street off-ramp and the section of Virginia Avenue SE between 6<sup>th</sup> and 9<sup>th</sup> Streets SE would be unaffected. The MOT for Alternative 4 during these initial months would be similar to the Phase 1 MOT for Alternatives 2 and 3 except that all the lanes would be available between 6<sup>th</sup> and 9<sup>th</sup> Streets SE. When construction moves east of the 5<sup>th</sup>/6<sup>th</sup> Street intersection, the detour for traffic exiting I-695 would start from the Phase 2 MOT plan noted above throughout the rest of construction. Similar to Alternatives 2 and 3, temporary decks over the would be provided along all cross streets from 2<sup>nd</sup> to 8<sup>th</sup> Streets SE and 11<sup>th</sup> Streets SE, and all properties adjacent to Virginia Avenue SE within the project limits would maintain access to the street grid through various measures as noted on Figures 3-15 and 3-16.

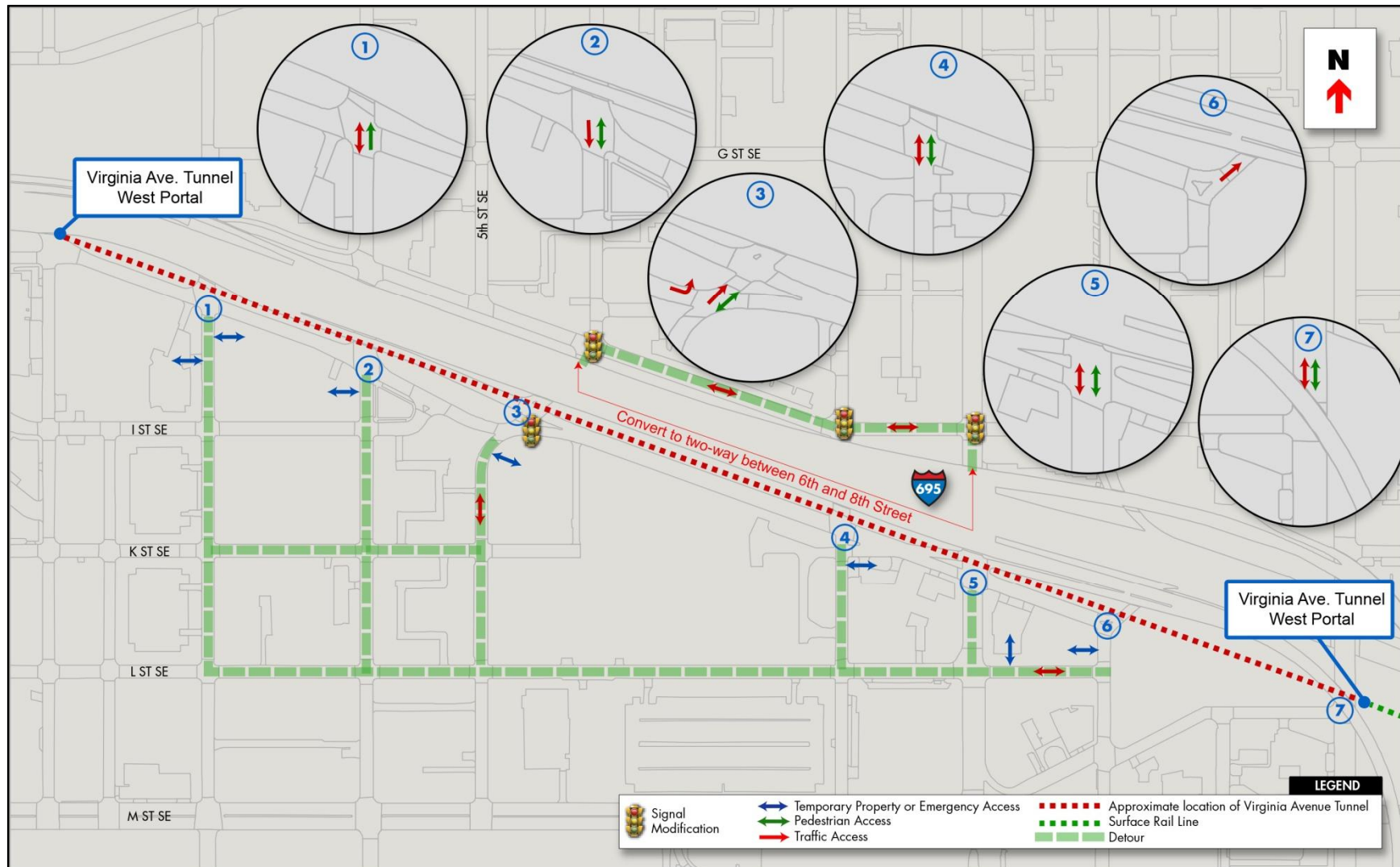
### 3.3.1.5 Safety and Security

The construction area for the Project would be secured to prevent unintended intrusion, including the areas used for temporary train operations. The general public would not be allowed to access construction areas or areas used for train operations, such as the runaround track/trench under Alternative 2. Safety and security measures would be implemented during construction, such as:

- Secure fencing at least eight feet high along the perimeter of the construction area, including around the areas with trains running in a protected trench, and at cross streets where vehicles, pedestrians and cyclists would be allowed to cross the construction zone (see photographs of sample fencing and barriers around construction sites);
- Suitable lighting for the construction area;
- Regular patrols by railroad police officers assigned to the Project;
- Access for first response and emergency vehicles to all property fronting the LOD (see Section 3.3.1.4); and
- Rodent control program initiated prior to the start of construction and maintained during entire duration of construction.



Figure 3-16  
Alternatives 2, 3 and 4 Maintenance of Traffic Plan, Phase 2



Stockade Fence Mounted on Traffic Barrier



Chain Link Fence Mounted on Traffic Barrier

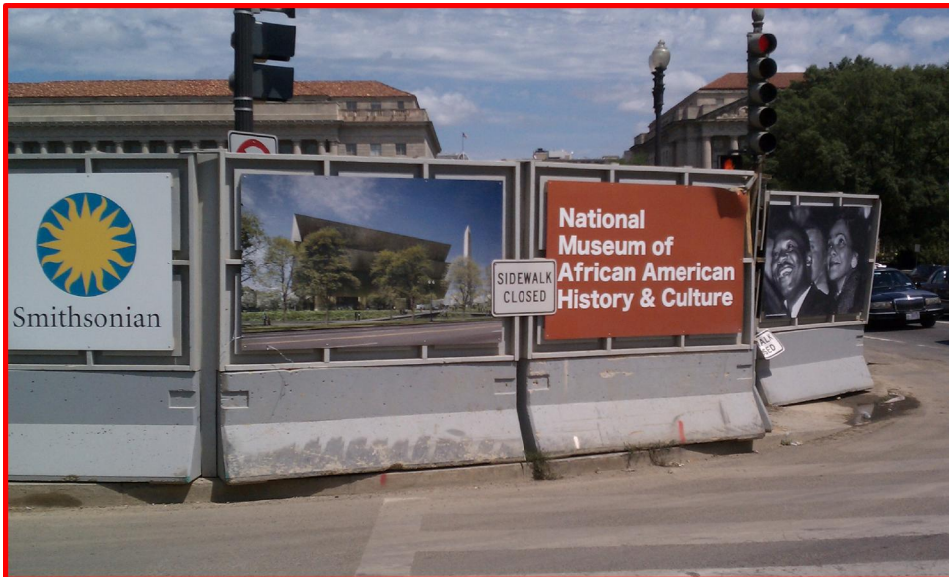




Typical Stockade Fencing



Banner-Mounted Fencing



### 3.3.1.6 Duration

For Alternatives 2, 3 and 4, construction work hours would be the same in accordance with District regulations. Standard construction work hours are between 7 AM and 7 PM, Monday



to Friday. Work on Saturday would require a permit from the District. Based on these work hours, estimated construction durations for each alternative were developed and presented on Table 3-5. This table also includes the estimated durations of the MOT phases described in Section 3.3.1.4.

Table 3-5  
Estimated Construction Duration by Alternative

Alternative	MOT Phase		Total Estimated Duration
	Phase 1	Phase 2	
Alternative 1	Not Applicable	Not Applicable	Not Applicable
Alternative 2	10-16 months	20-26 months	30-42 months
Alternative 3	16-22 months	14-20 months	30-42 months
Alternative 4	32-38 months	22-28 months	54-66 months

The estimated construction duration for each Build Alternative was based on certain factors including, among others, the proposed sequence of work, access restrictions, allowable work hours, known utility impacts, and available information about comparable construction projects.

The main reason that Alternative 4 is projected to take substantially longer to complete is because construction has to be conducted in a single, linear segment, starting at one end of the tunnel and continuing to the other end so that freight operations and rebuilding activities could be conducted at the same time within the same trench. The other two Build Alternatives are not restricted in such a manner. For example, Alternatives 2 and 3 allow for the same or similar construction activities (e.g., excavation) to occur simultaneously along different areas of the LOD, an option not available to Alternative 4. In addition, construction activities are anticipated to be slowed along the entire length of the Alternative 4's construction zone because of the close proximity between active rail operations and construction work areas. Also, additional safety regulations and safe work zone practices would need to be implemented for Alternative 4. These regulations and practices make the construction schedule for Alternative 4 highly dependent on railroad operational needs and customer service requirements.

### 3.3.1.7 Cost

As noted on Table 3-6, the total costs for Alternatives 2 and 3 would be similar (within approximately \$7 million). At approximately \$208 million, the total cost for Alternative 4, however, would be approximately 20 to 24 percent higher than Alternatives 2 and 3, respectively. The primary reasons for the higher cost for Alternative 4 is the longer construction duration and the extra safety precautions to accommodate construction and freight rail operations in the same trench.

Table 3-6  
Estimated Cost Breakdowns by Alternative

Alternative	Estimated Cost (or Millions)*
Alternative 1	Not Applicable
Alternative 2	\$175
Alternative 3	\$168
Alternative 4	\$208

Notes: \* Includes site preparation, demolition, construction, track work, MOT, environmental measures, landscaping, roadway restorations, professional services and indirect costs.

### 3.3.2 Post-Construction Conditions

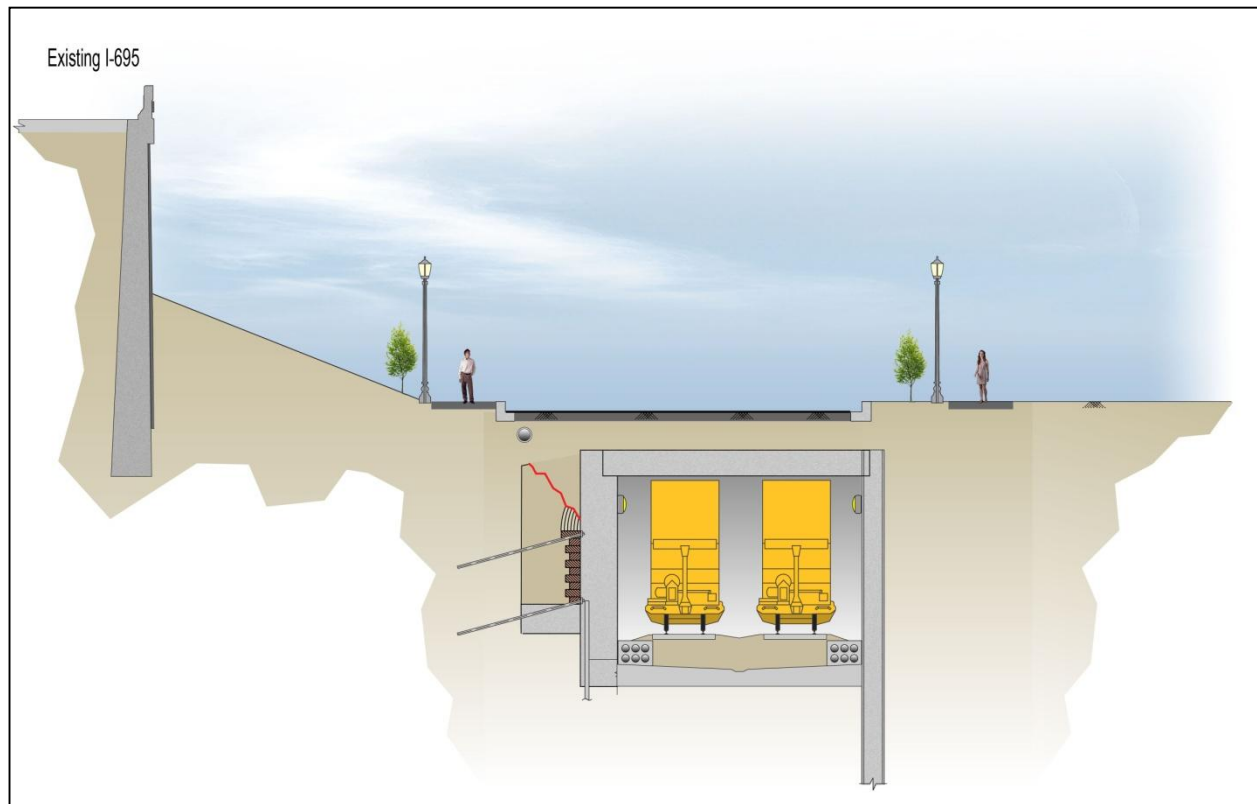
#### 3.3.2.1 Rebuilt Virginia Avenue Tunnel

Alternatives 2, 3 and 4 would result in rebuilt Virginia Avenue Tunnel with different configurations but still within the Virginia Avenue SE corridor. Alternatives 2 and 4 would result in a single tunnel with two railroad tracks, and Alternative 3 would result in two tunnels, each containing a single railroad track. All three Build Alternatives would provide tunnel(s) with enough vertical clearance to allow double-stack intermodal container freight trains. Alternative 1 (No Action or No Build) would maintain the existing tunnel as is for at least the near future. Additional information about Alternative 1 is provided in Section 3.1.

#### Alternative 2

Throughout the entire tunnel limits, Alternative 2 would shift the centerline of the rebuilt tunnel by approximately seven feet to the south from the existing alignment. (The centerline of the existing tunnel is located approximately at the middle of the existing rails. The centerline of the rebuilt tunnel under Alternative 2 would be located half way between the two sets of rails.) The shift is smallest at the west portal. It becomes approximately 10 feet roughly east of 3<sup>rd</sup> Street SE. A typical cross section of post-construction Virginia Avenue Tunnel under Alternative 2 between 3<sup>rd</sup> Street and 9<sup>th</sup> Street SE is shown at Figure 3-17. Although the surface above the tunnel would vary (e.g., different Virginia Avenue SE streetscapes, restored Virginia Avenue Park, etc.), the cross section of the rebuilt tunnel would be the same from portal to portal.

Figure 3-17  
Cross Section View of Post-Construction Alternative 2  
between 3<sup>rd</sup> and 9<sup>th</sup> Streets SE



### Alternative 3

From the west portal to the general vicinity of 3<sup>rd</sup> Street SE, the rebuilt Virginia Avenue Tunnel under Alternative 3 would be largely the same as under Alternative 2. From 3<sup>rd</sup> Street to Virginia Avenue Park, Alternative 3 would shift the tunnel alignment centerline by approximately 25 feet south. Both tunnels would be separated by a center partition wall, representing the centerline of the rebuilt tunnel. A typical cross section of the two tunnels of Alternative 3 between 3<sup>rd</sup> and 9<sup>th</sup> Streets SE is shown on Figure 3-18. Due to the construction of new columns as part of the 11<sup>th</sup> Street Bridge project, the two tunnels would become separated between 9<sup>th</sup> Street and the east portal. The separation would be widest at the east tunnel portal where it would be approximately 65 feet centerline to centerline. The east tunnel portal would consist of two single-track tunnel openings.

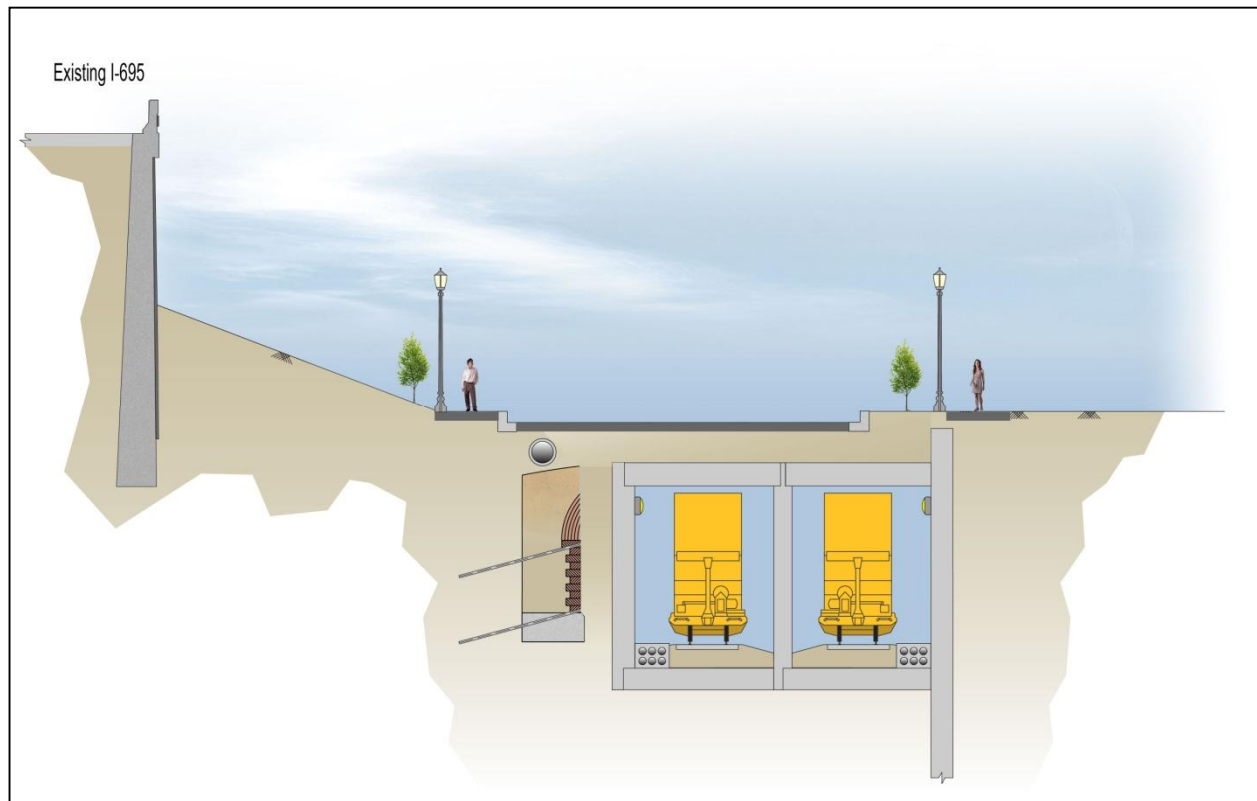
Figure 3-18  
Cross Section View of Post-Construction Alternative 3  
between 3<sup>rd</sup> and 9<sup>th</sup> Streets SE



#### Alternative 4

From the west portal to the general vicinity of 3<sup>rd</sup> Street SE, the rebuilt Virginia Avenue Tunnel under Alternative 4 would be the same as under Alternative 2. From 3<sup>rd</sup> Street to the east portal, Alternative 4 would shift the tunnel alignment centerline by approximately 17 feet south. Similar to Alternative 2, both tunnels would be separated by a center partition wall, representing the centerline of the rebuilt tunnel. A typical cross section of post-construction Virginia Avenue Tunnel under Alternative 4 between 3<sup>rd</sup> and 9<sup>th</sup> Streets is shown at Figure 3-19. Although the surface above the tunnel would vary (e.g., different Virginia Avenue SE streetscapes, restored Virginia Avenue Park, etc.), the cross section of the tunnel would remain the same between 3<sup>rd</sup> Street SE and the east tunnel portal.

Figure 3-19  
Cross Section View of Post-Construction Alternative 4  
between 3<sup>rd</sup> and 9<sup>th</sup> Streets SE



### 3.3.2.2 Streetscape and Other Surface Areas

Upon completion of tunnel construction, the street and other affected areas, such as Virginia Avenue Park and the Marine Corps Recreation Facility, would be restored to at least the conditions prior to construction. The restored roadway configuration of Virginia Avenue or streetscape may change from current conditions. For example, the number of lanes may change and new pedestrian, parking and cycling amenities could be provided, regardless of the selected Build Alternative. Changing the streetscape of Virginia Avenue SE is technically not part of the Project. However, the Project provides the opportunity to construct a new streetscape for Virginia Avenue SE and be incorporated as part of each Build Alternative. Although various design options are being developed, for purposes of this Draft EIS, the following elements are assumed to be constructed or provided by the Project and would be part of the post-construction condition of Virginia Avenue SE between 2<sup>nd</sup> and 9<sup>th</sup> Streets SE:

- Improved access to Garfield Park for wheelchair dependent individuals;
- Bicycle lane and/or shared-use pedestrian/bicycle path between 2<sup>nd</sup> and 9<sup>th</sup> Streets SE;
- Two possible roadway configurations between 4<sup>th</sup> and 5<sup>th</sup>/6<sup>th</sup> Streets SE:

- Straightening the Virginia Avenue SE alignment between 4<sup>th</sup> and 5<sup>th</sup>/6<sup>th</sup> Streets SE and eliminating I Street SE between these streets, or
- Converting this section of Virginia Avenue SE into an inactive street;
- Provide additional landscaping, such as the area between 4<sup>th</sup> and 5<sup>th</sup>/6<sup>th</sup> Streets SE due to the proposed changes noted above;
- Possible reduction in the number of lanes from four to three between 5th and 7th Streets SE;
- Provision of additional on-street parking where appropriate;
- Conversion of Virginia Avenue SE between 8<sup>th</sup> and 9<sup>th</sup> Streets SE from one-way to two-way operations; and
- Improved street lighting, traffic signals and crosswalks.